the OIL AND GAS JOURNAL

JANUARY 13, 1958

Well data at Fingertips

. . . with Richfield's new punch-card record system

p. 54

P.D. Meters for LACT p. 74

Acetylene-Ethylene Cracking Process p. 78

Fracturing 89 Per Cent Successful p. 94

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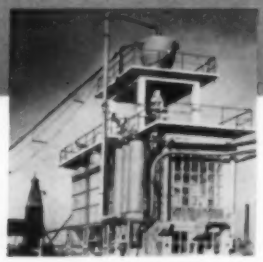

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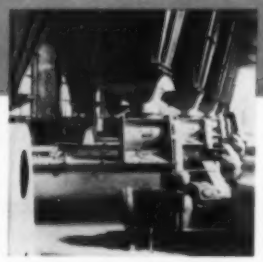

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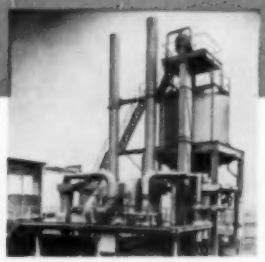

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the OIL AND GAS JOURNAL Newsletter

Tulsa, Okla.
January 13, 1958

Pipeline building will remain at high levels in 1958:

This segment of the industry is full of surprises.

Many observers had figured that political, regulatory, financial, and market problems besetting pipelining spelled wholesale cutbacks this year.

But a survey of company officials gives this outlook:

Natural-gas construction, which accounts for bulk of pipeline activity, will remain brisk.

Most projects booked for this year will be built.

Financing of several others proposed will be held up pending final outcome of the controversial Memphis case. Gas men believe this astounding decision somehow will be offset. They think consumer pressure for more gas to serve expanding markets will force more lines to be built.

Some officials see either higher court or Congress reversing the Memphis decision before the year is out. They say: Expect demand for line pipe to spurt in last half.

Products and LPG lines won't expand much.

You can expect some new lines to be announced soon in the Mid-Continent and Rocky Mountains. But most major projects already have been scheduled for the year. These include Laurel line from Philadelphia to Cleveland and Ohio Oil's Wood River to Chicago system.

Crude-oil lines will be down most.

High interest rates and, more important, a soft crude market will prove deterrents to expansion.

One casualty is proposed 26-in. line from Midland, Tex., to Houston discussed last year by several companies. It has been shelved for time being.

The FPC, meanwhile, is not freezing rate increases to natural-gas pipeliners in wake of Memphis decision.

Agency is carrying appeal to Supreme Court and awaiting final settlement before making any sweeping policy changes. In fact, FPC has granted one sizable increase. Only change: Company is now required to post bond or put additional revenue in escrow to insure full refund if necessary.

Oil and chemical workers may come up with an answer to expected management resistance to higher wages: Let the workers share in company profits.

OCAW Union President Knight has brought the idea out into open.

He suggests royalty payments based on company's production. They would go into a savings and emergency fund jointly administered by union and management. Each worker would be personally credited with his prorated share.

Knight contends plan has these advantages: It's flexible and would give worker share in automation gains.

Educators see good coming from the end of frenzied bidding for engineering graduates. They say recruiting is off this year, but actually it's nearly back to normal.

Dr. John Campbell, head of University of Oklahoma's petroleum engineering, reports his top seniors will get several job offers. Others will eventually find spots.

Present situation may be good for both the students and companies, according to Dr. Campbell, because:

...Unrealistic salary bidding is over. This tended to give student inflated idea of his value, took some of the edge off his ambition, and ultimately led to dissatisfaction when fledgling oil engineer ran into stark reality of job with the company.

...Tighter labor market worries students. This is good because they'll study harder, work harder when they become oil-company employes.

Long-range outlook for engineering graduates is still good:

Variety of jobs seems assured as industry expands to fill the needs of a growing population.

Supply trend also is assuring. Engineering-student enrollments are moving up with the population growth. They average a 3 per cent gain each year.

But Dr. Campbell believes emphasis in the future should be on quality in engineering with a general knowledge of science and math the heritage of every high-school student.

Ghosts of the 1920s and 1930s came back last week to haunt oil men with interests in Latin America.

In those days revolutions were a chronic headache and one of the hazards of doing business in the southern half of the Western Hemisphere.

Oil companies with a $3-billion stake in Venezuela have operated for years now under its firmly controlled but stable government.

They watched uneasily as the military regime of President Marcos Perez Jimenez moved swiftly to crush an air-force revolt almost before it got started.

The country's oil industry wasn't remotely threatened in the abortive and short-lived rebellion.

But the big question oil men are almost afraid to ask aloud: Does this end it—or is the revolt only a portent of things to come?

Cities Service is pioneering use of positive-displacement meters on an automatic-custody transfer unit in Texas.

The meters are unattended and used without duplicate measure of crude in a tank, the first such use in Texas.

Cities Service has found that skid-mounted design makes field installation of the meter setup quick and easy. More important: The unit is accurate and reliable and can save money (p. 74).

Fracturing has brought a nice payout to Fullerton Clear Fork Unit wells in West Texas.

Of 37 wells treated, 33 are considered successful.

The balance sheet: Gross expenditures of $249,888 for an average of $6,754 per well. This outlay already has been repaid and $63,280 profit realized. Current additional monthly income derived from fracture treatment is $27,727.

Production increase has totaled 156,000 bbl. Current average increase in daily allowable is 26 bbl. per well (p. 94).

Foreign exploration is off to a running start in 1958:

Another flush producer has been completed in the middle of Lake Maracaibo.

It's the sixth big well within a radius of 1½ miles in a remote area of the lake and the second major well for the Sun-Atlantic-Seaboard group in Block 1.

The well tested at rate of 6,063 bbl. daily of 31.6°-gravity crude through a ¾-in. choke. It is producing from a 98-ft. section of basal Eocene horizon.

Several other wildcats in the lake also are approaching critical depths in first tests of valuable new tracts.

A 40,000-acre concession in Colombia may be taken over by a Texas independent, Ambassador Oil Corp.

The area is in the Sinu basin 100 miles south of the Caribbean Coast and is ringed by tracts held by major firms. Ambassador, headed by F. Kirk Johnson, is dealing to acquire the concession from Dr. Victor Oppenheim, Dallas.

Activity in Panama will become hotter this year.

Another firm has entered the region. A subsidiary of Eastern States Petroleum has acquired a 1,500,000-acre concession extending the width of the isthmus. Plans call for immediate basic survey and exploratory work.

Eastern States acreage is north and east of tracts held by United Fruit Co. which is planning a deep test. A Denver-controlled company also plans to spud a deep test northeast of the Eastern States area.

Puerto Rico has a new oil law.

It hopes through more favorable regulations and tax exemptions to attract an active exploration program on the island.

One exploration permit has been issued covering most of the north coast Tertiary basin. Several other applications are being considered by island officials.

One of 1958's first wildcat gambles will start soon in a remote offshore area of the Persian Gulf.

First submersible drilling barge ever brought in the Persian Gulf is being fitted on Das Island by British and French combine.

It will be towed soon to location 20 miles northwest near center of wildcat part of the gulf. It will be the first test on a 12,000-sq.-mile concession.

The pot still simmers in Texas to get a market for shut-in crude production.

Long fight by producers to force pipeline connections for all wells in the state finally has been taken under advisement by the Railroad Commission. Final arguments came last week, nearly a year after fight was formally launched.

New life, meanwhile, has been injected into the 14-year-old dream of a pipeline from West Texas to California. This line proposes to link a Texas surplus-oil area with oil-hungry California.

Jay Taylor, Amarillo banker and independent producer, has taken over as president of West Coast Pipeline Co. and is heading a combine to push the $130-million project.

Oil men are breathing easier about those price cuts. Generally they've remained small so far and are localized.

Here is the picture:

Lower Gulf Coast is undergoing downward adjustment.

Illinois basin's lowered prices are taking hold and have spread to Corning areas in Ohio.

Elsewhere market is soft but majors are resisting any move to reduce prices generally.

What can you expect from Congress?

Harris bill will come up again—probably next month—if a poll shows it has a chance.

No general tax cuts are in the book.

Bureau of Mines gives this forecast for 1958:

Domestic demand up 2.5 per cent to 9,024,000 bbl. daily.

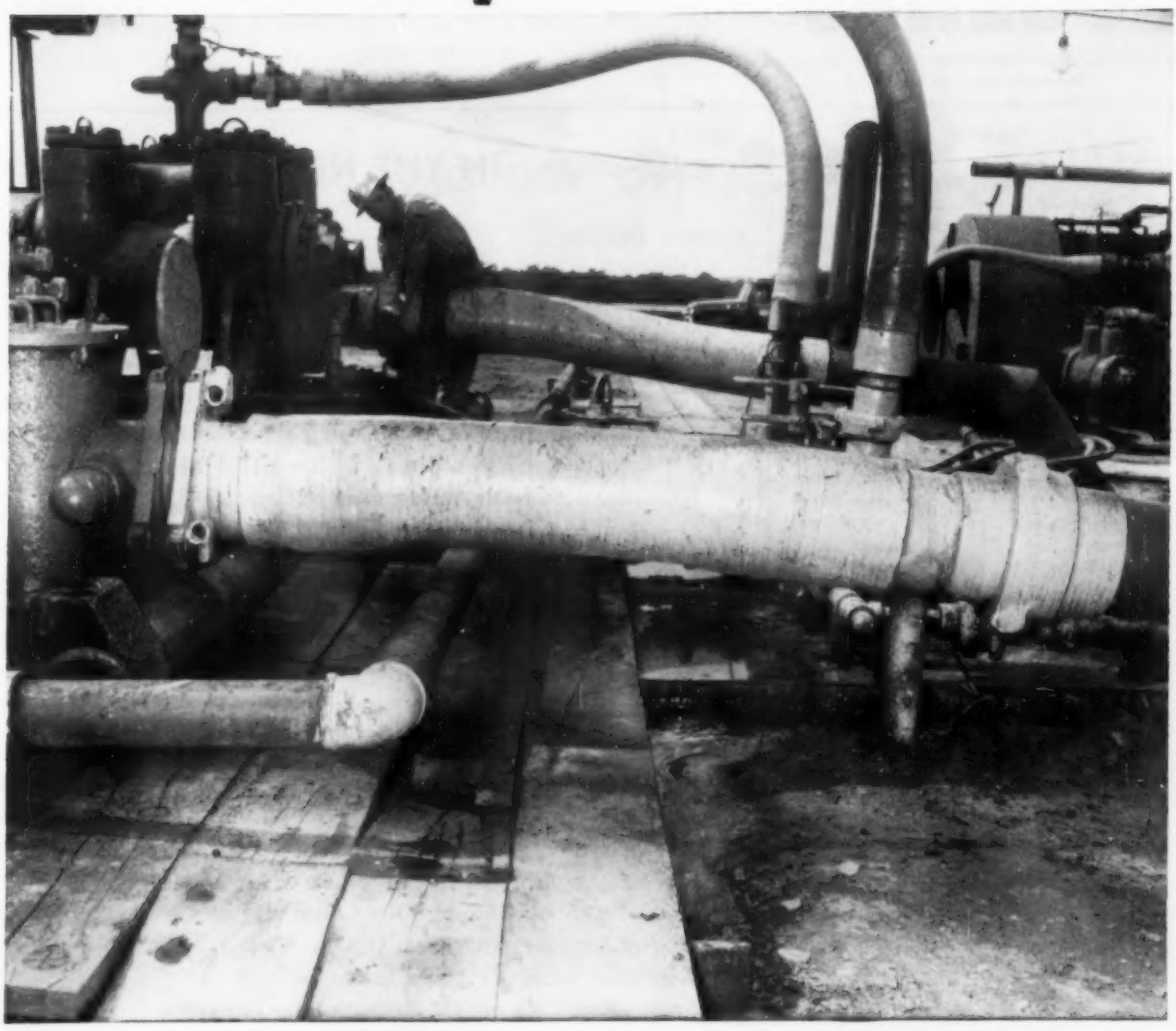
Production off 1.5 per cent to 7,861,000 bbl. daily.

Crude runs about same at 7,927,000 bbl. daily.

Oil imports about same at 990,000 bbl. daily.

Product demand—up for gasoline and distillate but down for kerosine, residual, and others.

B.F.Goodrich report:



Hose soaks up the shudders that used to shorten pump life

DESTRUCTIVE vibration from a pounding mud pump is completely absorbed by B.F.Goodrich mud pump suction hose. As a result, both the hose and the pump last longer. There's less down time, lower operating costs.

To deaden vibration, B.F.Goodrich engineers made the hose more flexible. Rayon cord is used for reinforcement, rather than the stiff, wrapped plies of fabric found in ordinary hose. The cords run parallel with no cross threads to tie them together, are completely surrounded by rubber. They are free to "give" and absorb the pump's shaking action.

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The OIL AND GAS JOURNAL

JANUARY 13, 1958 • VOLUME 56 • NUMBER 2

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Journal Index Will Be Out This Week

The Journal's annual index is on the presses and will be available this week. The index lists stories and articles printed in 1957.

Journal subscribers may get free copies by mailing a postcard request to The Reader Service Department, The Oil and Gas Journal, Box 1260, Tulsa, Okla.

OIL AND GAS PIPELINES • REFINING • PETROCHEMICALS
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TECHNOLOGY—OPERATION

Refining-Processing

New Cracking Process for Acetylene and Ethylene 78

By G. A. Akin, T. F. Reid, and R. J. Schrader

These chemical building blocks may be produced in commercial quantities by this new pyrolysis process. It has been proved in a semiworks experimental furnace with an annual capacity of a million pounds of acetylene plus ethylene. The furnace has operated for a total of 12 months.

Catalyst Erosion in Cat Crackers—4 81

By Larry Resen

The final installment in a four-part series devoted to problems and their solutions in the field of erosion caused by catalyst in fluid catalytic crackers. The equipment modifications can for the most part be made by regular maintenance personnel.

Questions on Technology 111

Field Processing 113

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Drilling-Production

Cities Service Uses P.D. Meters for LACT 74

By Ed McGhee

This Gray County installation is a Texas first. None other in the state has used positive-displacement meters in unattended operation and without duplicate measure of the crude in a tank. The skid-mounted design makes field installation quick and easy. The unit is accurate and reliable and can save money.

Secondary Stresses in Welded Offshore Drilling Structures 86

By E. W. McMillin and L. B. Parker

These stresses are highly significant in structures left in deep water and therefore should not be ignored. Bending stresses may be nearly as high as the primary stresses, and the two stresses are cumulative. Ignoring secondary stresses can result in permanent deformation or individual joint failure.

Fullerton Clearfork Fracturing Successful 94

By George R. Locker

Thirty-seven wells have received fracture treatments, with 33 considered successful. Gross expenditure for treatments was $249,888. This has been repaid and a profit of $63,280 after payout has been realized. Current additional monthly income due to fracturing is $27,727.

Pipelining

Cities Service Uses P.D. Meters for LACT 74

Protecting Pipeline Stations Against Electrical Transients 103

By E. B. Turner

The station needs: (1) station-type lightning arrestors at transmission voltage level for supply transformer; (2) surge protection on station bus, located properly; and (3) either dead line check relaying or time delay automatic reclosure on power supply system.

On The Job . . . Pipelining 117

By Paul Reed

Natural Gas Pipeline Co. of America is using several types of coating for corrosion protection on its current Texas-Oklahoma expansion project. This installment is devoted to hot-coating applications, both asphalt and coal-tar.

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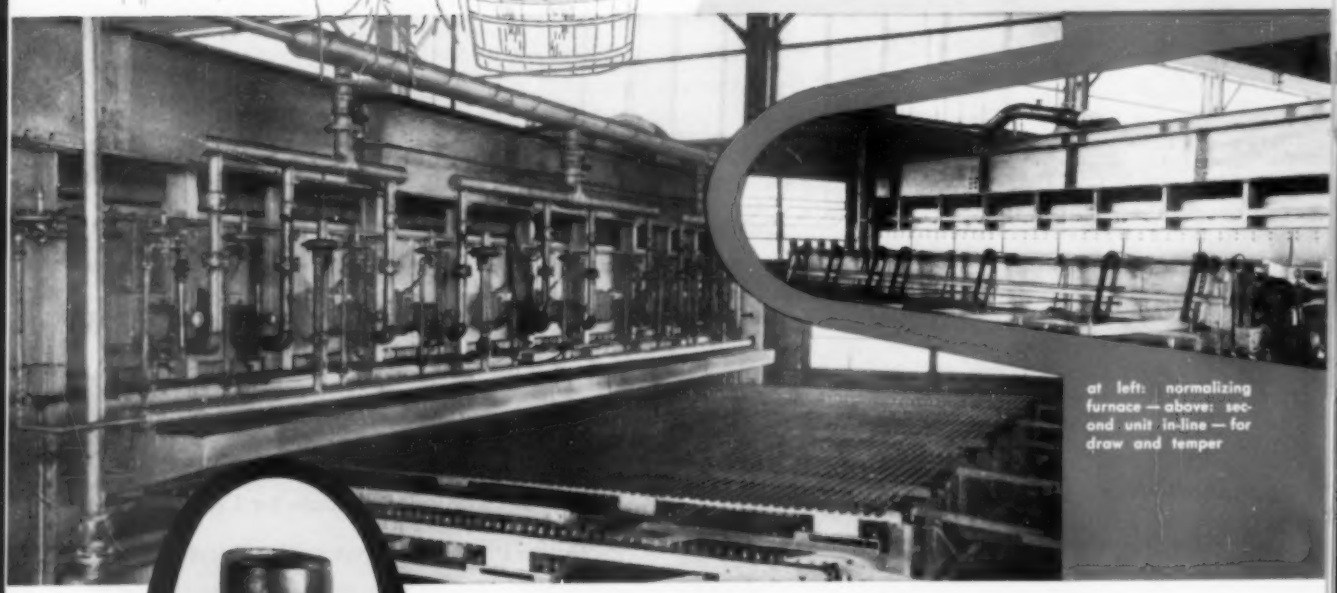
CHANGE IS INEVITABLE

— The Right Change Is Progress

The village blacksmith was considered an expert on heat-control . . . but his art would be lost here!



at left: normalizing furnace — above: second unit in-line — for draw and temper

Unretouched photograph of rod end before heat-treat. Note clean smooth forging by electric-induction process, unique with Norris.

. . . in LARGEST, MOST MODERN SUCKER ROD PLANT in the Oil Industry!

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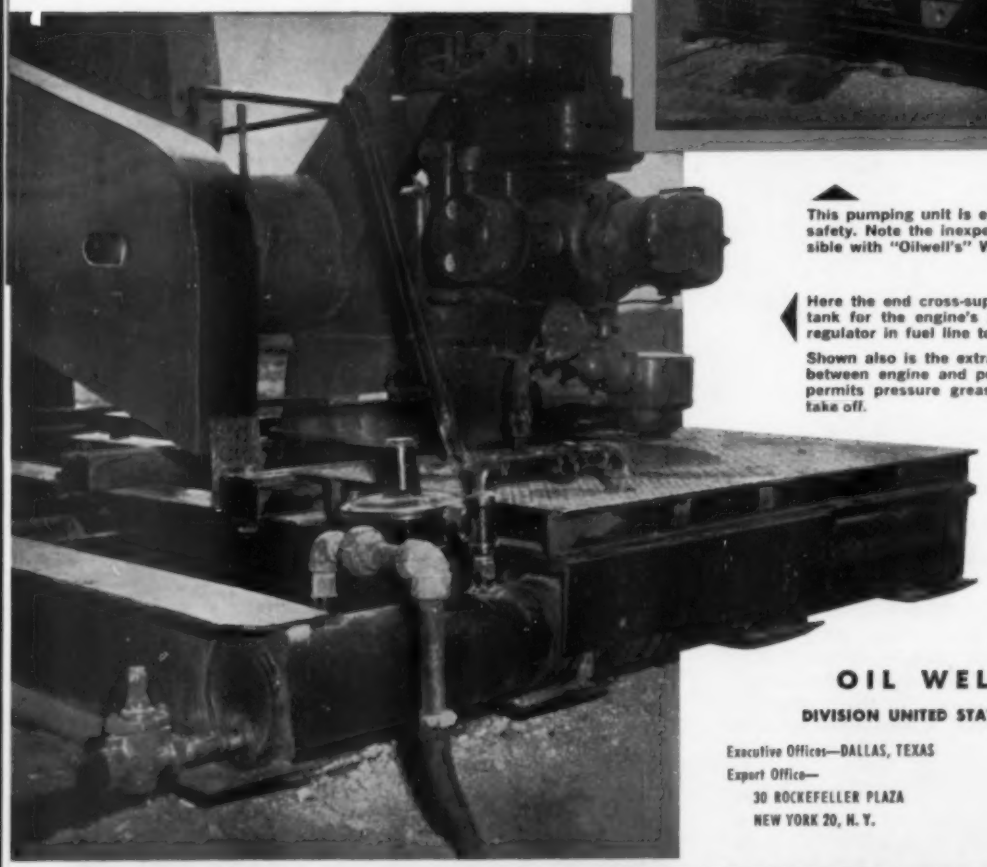

This pumping unit is equipped with crank guards for extra safety. Note the inexpensive grade-and-set installation possible with "Oilwell's" Wide-Base Pumping Unit.

Here the end cross-support was converted into a scrubber tank for the engine's gas fuel supply, with gas pressure regulator in fuel line to the engine.

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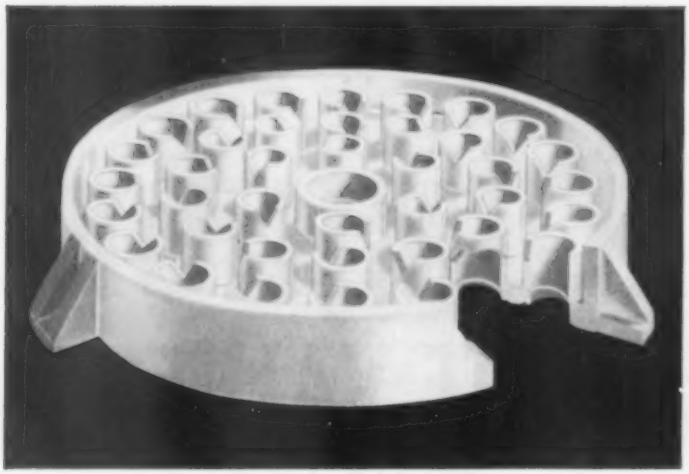
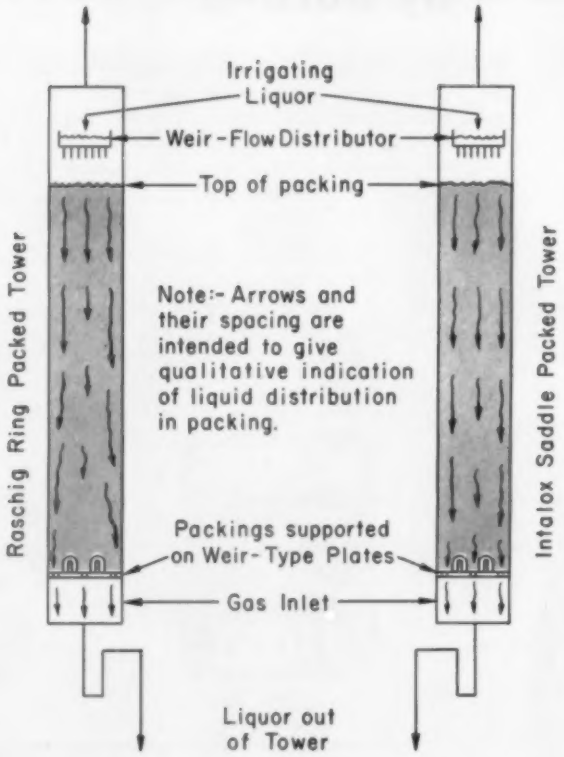
How to achieve better liquid distribution in PACKED COLUMNS




Irrigating Liquor
Weir-Flow Distributor
Top of packing
Raschig Ring Packed Tower
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Packings supported on Weir-Type Plates
Gas Inlet
Liquor out of Tower

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** Made in chemical ceramics, carbon steel, or stainless.*

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Full details in this NEW Bulletin

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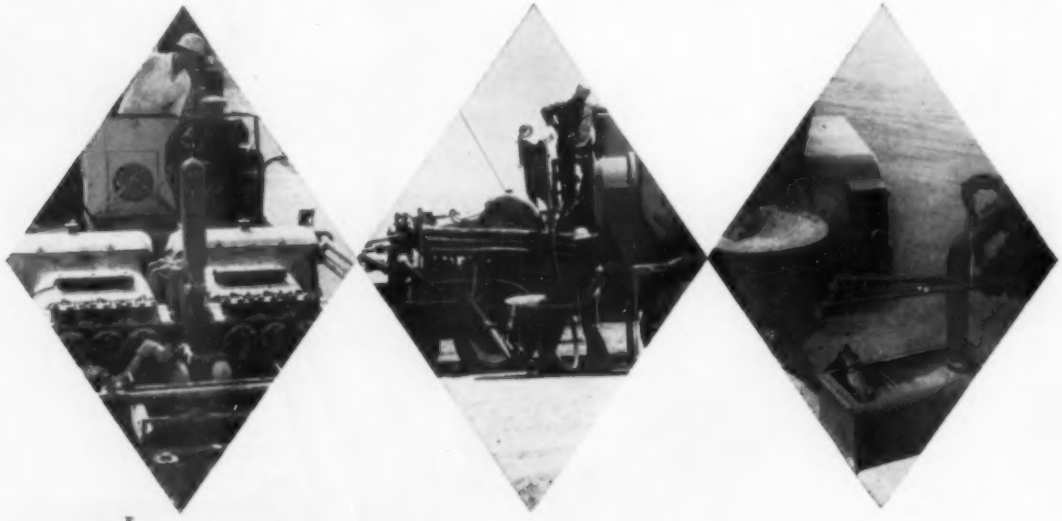
OLIVER **THE OLIVER CORPORATION**

Industrial Division, 19300 Euclid Avenue, Cleveland 17, Ohio

a complete line of industrial wheel and crawler tractors and matched allied equipment

PLACE SLURRY EFFICIENTLY
IN DEEP WELLS
WITH
HALLIBURTON

MULTIPLE-STAGE CEMENTING



In today's increasingly deep wells, you can cement as many as three zones ... in one continuous operation or at desired time intervals ... using as many as three types of slurry ... with Halliburton MULTIPLE-STAGE CEMENTING. It combines these advantages ...

- reduced channeling
- protection against fluid loss to "thief" formations
- formation seal-off at predetermined points
- reduced pumping pressures
- multiple zone completions

Investigate the benefits of Halliburton MULTIPLE-STAGE CEMENTING for efficient placement of slurry in your medium to deep wells. Call your local office or write Halliburton Oil Well Cementing Company, Duncan, Oklahoma.

HALLIBURTON

OIL WELL CEMENTING COMPANY DUNCAN, OKLAHOMA

Here are a few Halliburton products used in multiple-stage cementing that have helped lengthen the lives of thousands of wells...

HALLIBURTON'S "DV" MULTIPLE STAGE CEMENTER ...for primary cementing on outside of casing string. With special plugs and a baffle, two and three-stage cementing on same string is possible ...in continuous operation or at desired intervals... using two or three different types of materials. Designed for positive fluid shut-off by means of hydraulically operated dual sleeves and high pressure packing.

Better Cementing means Longer Well Life

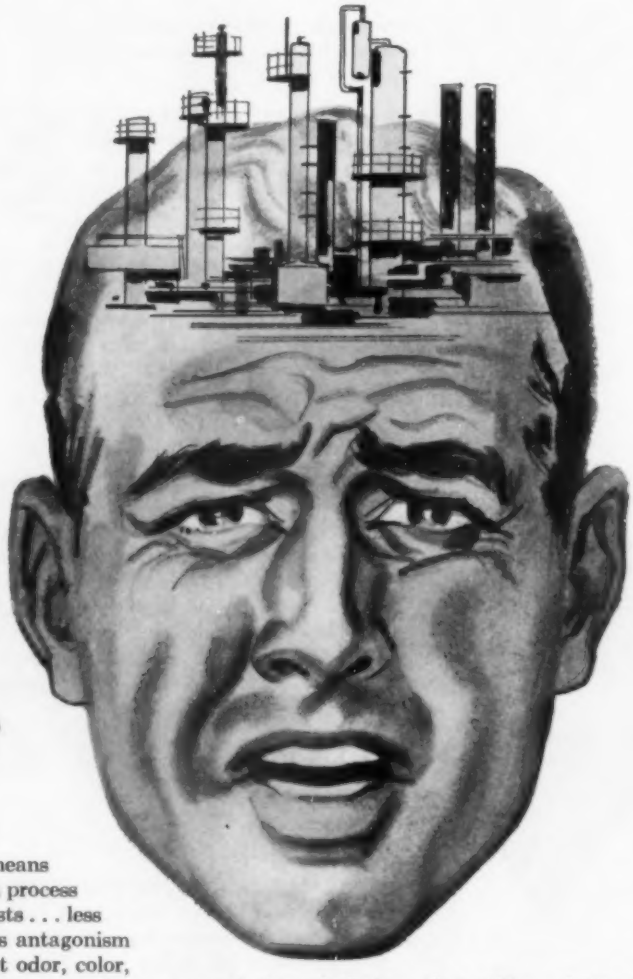
HALLIBURTON CEMENT BASKETS...often used below "DV" Multiple Stage Cementer to retain cement and protect weak formations by reducing slurry loss of formation breakdown. Run on outside of casing or liner at point above weak or porous formations. After cement is pumped, basket opens, helps support heavy cement columns until they take initial set.

HALLIBURTON'S S-3 CASING CENTRALIZERS... with heat-treated, lap-welded springs to minimize channeling, aid in uniform placement of cement around casing. Cut later remedial expenses. Specially designed Heavy Duty and Slim Hole types where needed.

HALLIBURTON'S HOWCOGEL ... a high yield bentonite used in cement to reduce slurry weight and increase slurry volume. Reduces slurry cost...When mixed with mud, provides low fluid loss. Reduces filter cake thickness and has outstanding gel-strength properties. A good suspending agent for cuttings or weighting materials.

CEMENTING SERVICES

284 SERVICE CENTERS—JUST MINUTES AWAY FROM ANY RIG



Why Suffer with Sulfur?

Less sulfur in the refinery stream means less corrosion and gum formation in process equipment . . . lower investment costs . . . less contamination of catalysts . . . less antagonism toward TEL . . . improved product odor, color, and stability . . . more profit in many ways for both the refiner and marketer.

Kellogg has the economic answer to high sulfur crudes. Working closely with the refiner's engineers, as it has done with those of leading oil companies on the East and Gulf Coasts—as well as in England, Belgium, France—Kellogg can design a unit to remove harmful sulfur compounds to almost any degree desired. In one typical instance, weight per cent was reduced from 0.84 to 0.08 in catalytic gas oil, and from 0.66 to 0.05 in furnace-oil distillate.

Optimum investment and operating costs are assured through designs that utilize selectively lower pressures, reduce the use of costly alloys such as 18-8, and lower the consumption of high pressure hydrogen.

Kellogg desulfurization units can be engineered to treat virgin streams of naphtha, kerosene, gas oil and other fuels, and cracked stocks of similar boiling ranges. Or units can be designed to operate simultaneously on streams from the topping and cracking units. Where desired, the design can include equipment to recover the sulfur as a salable by-product. Your inquiries will receive prompt attention.

REFINERY PROCESS DIVISION

The M. W. Kellogg Company

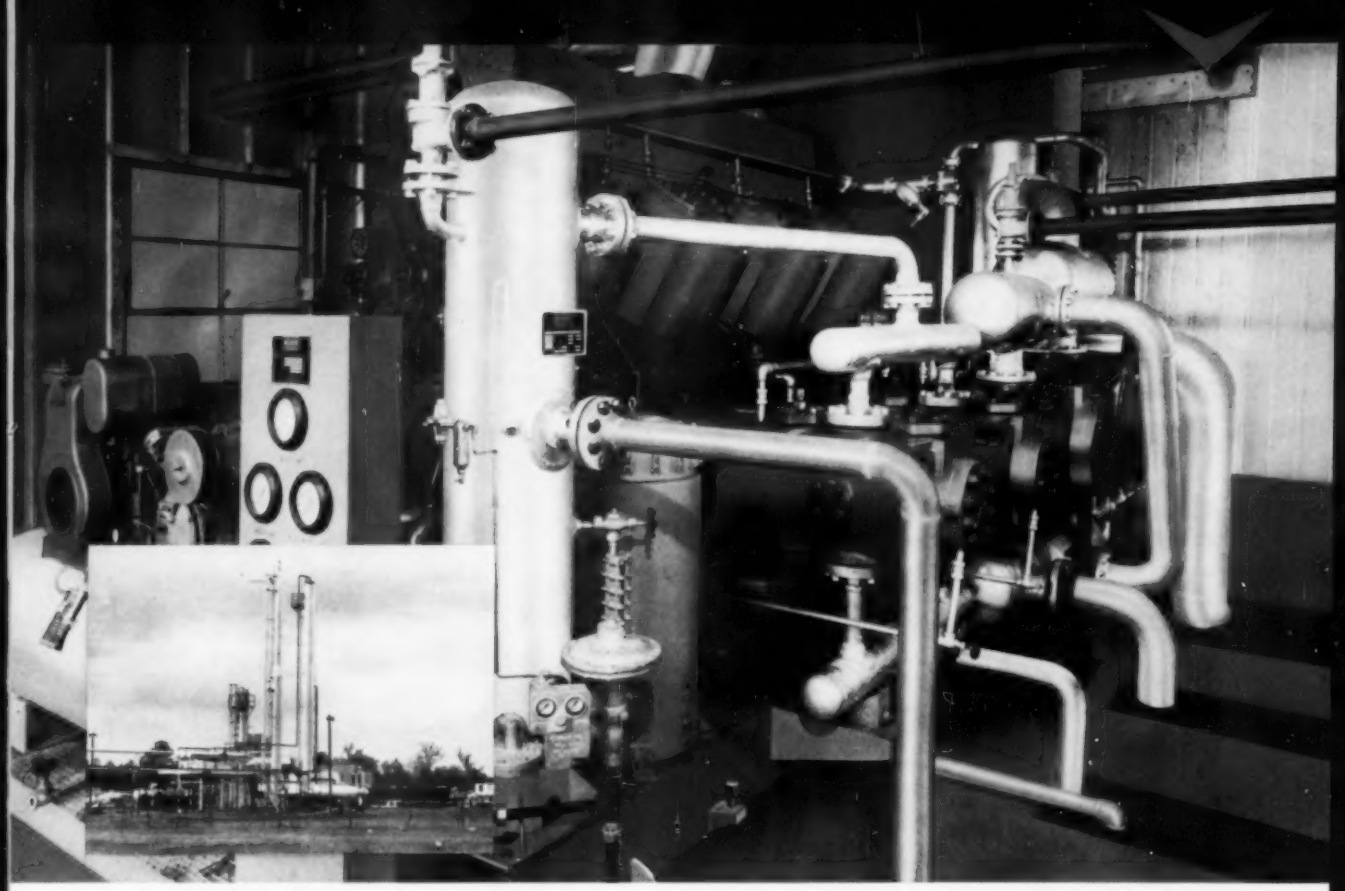
711 THIRD AVENUE, NEW YORK 17, N. Y.

A SUBSIDIARY OF PULLMAN INCORPORATED

The Canadian Kellogg Co. Ltd., Toronto • Kellogg International Corp., London • Kellogg Pan American Corp., N.Y.
Societe Kellogg, Paris • Companhia Kellogg Brasileira, Rio de Janeiro • Compania Kellogg de Venezuela, Caracas

M KELLOGG W

BEAIRD-INGERSOLL-RAND Packaged Compressor Plant



Jones-O'Brien, Inc. North Keatchie Gas Separation facility equipped with a Beaird-Ingersoll-Rand 440 h.p. 8SVG packaged compressor. Unit has radiator with lubricating oil cooler and updraft air turning duct. Semi-automatic operation has been achieved by equipping unit with speed and pressure regulators and shutdown devices. Other sizes from 120 to 660 h.p.

Gas Separation Facility Uses

DUAL PURPOSE PACKAGED COMPRESSORS

Jones-O'Brien, Inc. has redesigned its North and South Keatchie gas separation facility to increase efficiency and convert to profits 2,200,000 cubic feet of gas being flared daily.

Both facilities have now been equipped with Beaird-Ingersoll-Rand packaged compressors. At the north facility an 8SVG 440 h.p. unit has been set up to perform a dual task. Two cylinders are compressing propane used as a refrigerant in the extraction process and two cylinders are boosting low pressure gas up to sales line pressure. The unit is set to supply 2.68 mmcfd of 200 psi propane from an input of 10 psi. The other two cylinders will boost 1.1 mmcfd of natural gas from 200 psi to 1,150 psi.

A 330 h.p. Beaird compressor at the South facility is boosting 1.2 mmcfd of natural gas to the sales line. Both units have been designed for semi-automatic operation. Engines are equipped with speed and pressure regulators that permit them to speed up and slow down to maintain a constant suction pressure. Other controls and shutdown devices protect the units from unforeseen changes in operating conditions.

Let us show you how Beaird Packaged Compressor plants will fit into your plant modernizing program.

BEAIRD
another AMF product
PACKAGED COMPRESSOR PLANTS

LOWEST COST PER HORSEPOWER INSTALLED

THE J. B. BEAIRD COMPANY, INC.
Shreveport, Louisiana

A Subsidiary of American Machine & Foundry Company

SHREVEPORT, LOUISIANA. *Sales Offices: Dallas, Houston, Corpus Christi and Midland, Texas • New Orleans, Louisiana • Tulsa, Oklahoma • Denver, Colorado Los Angeles, California • Caracas, Venezuela • Cie. Ingersoll-Rand, Paris, France.*

J&L Service

wraps up the world's most wanted

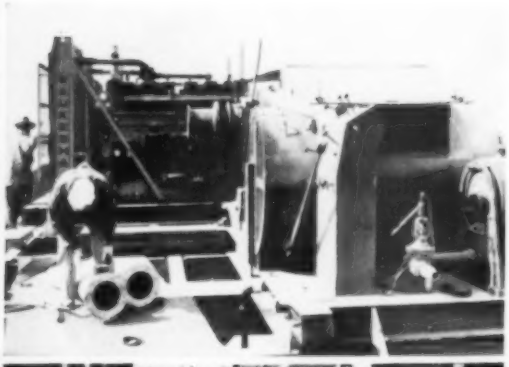
Rotary Rigs

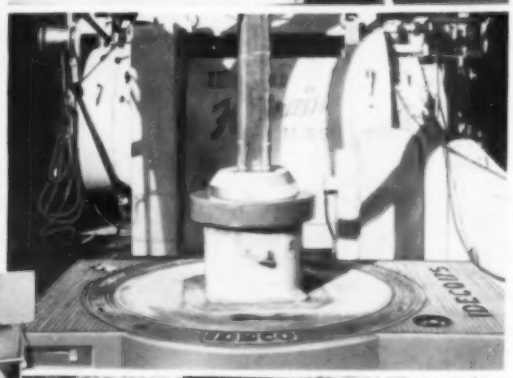
A driller's natural desire to own the last word in equipment has made Ideco the most wanted rotary rigs in the world.

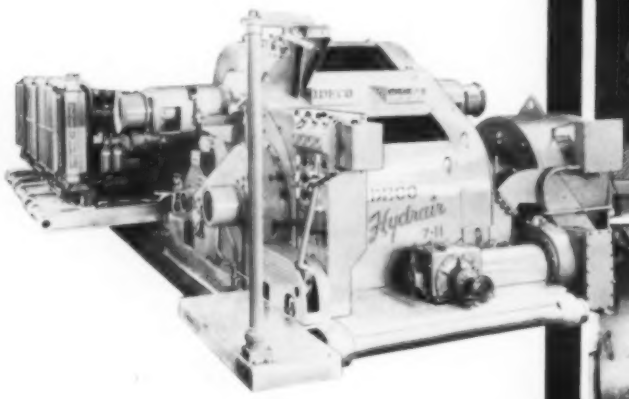
J&L parts service wraps up this situation — makes these finest of all rigs the best buy in the United States and Canada.

J&L has an Ideco designed and rated to do the job you have in mind and — thanks to J&L service — keep on doing it.

For detailed descriptions, specifications, performance characteristics, get your J&L store on the telephone. Ask for Catalog.







Rig capacities from 2,500′ to 20,000′ with 4½″ drill pipe. Rigs to 6,000′ capacity can be trailer mounted.

"Hydrair" hoists combine a hydraulic torque converter drive with air clutch and air controls.

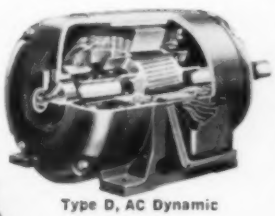
Power rigs have a mechanical or fluid-coupling drive, with air clutch and air controls.

Jones & Laughlin

SUPPLY DIVISION – Tulsa

J&L – A GREAT NAME IN SUPPLIES

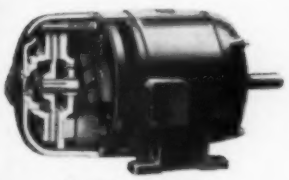
GIVE YOUR PRODUCTS THE BEST OF BRAKES!



Type D, AC Dynamic

ROLLING STOP... Master Type D Dynamic Unibrake Motors. Braking is obtained with a unique, patented brake winding superimposed on the stator winding. Simple, compact, with no DC current required, the brake has no moving parts. There is nothing to wear or adjust... braking torque repeats consistently. Particularly recommended for automatic applications where static holding is not desired. Sizes ¼ to 30 H.P.

MASTER UNIBRAKE MOTORS



Type M—Magnetic

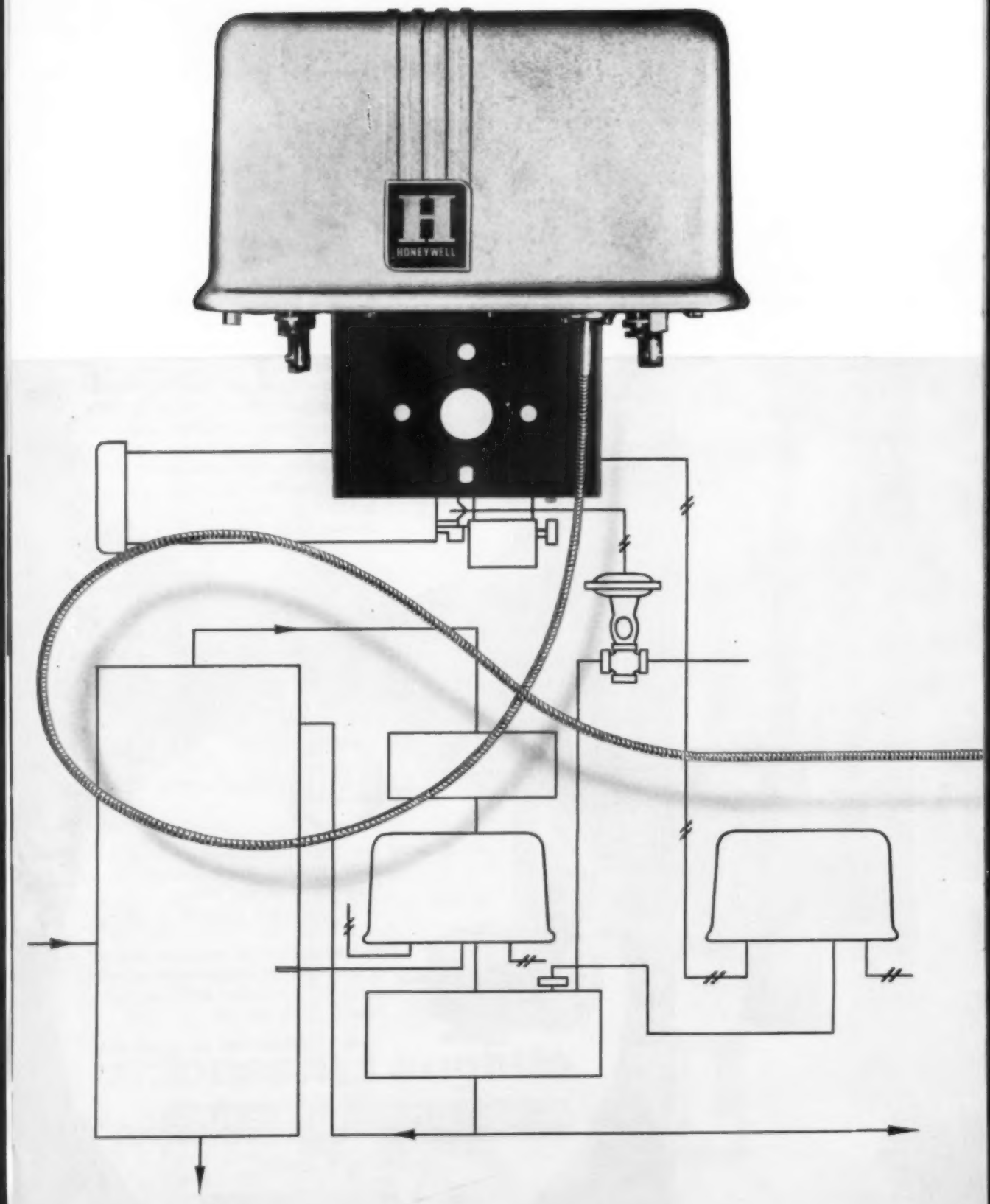
STOP-HOLD... Master Type M Magnetic Unibrake Motors. For quick, controlled stopping... especially when you want to hold the load. Spring-setting magnetic brakes of the friction disc type combine with motor in a compact, integral unit. Sizes... ⅛ to 150 H.P.

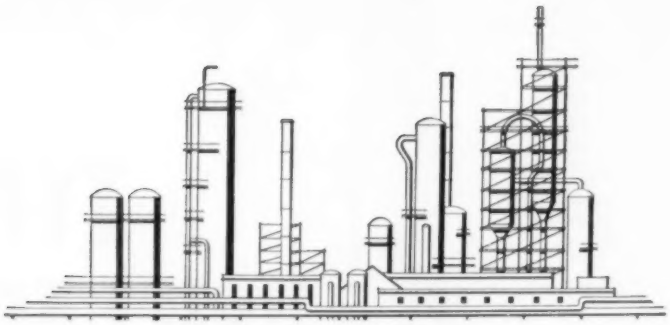
MASTER GEARMOTORS and variable speed drives can be furnished with Unibrakes, too. See Master for the perfect power drive for you.

THE MASTER ELECTRIC CO.

DAYTON 1, OHIO

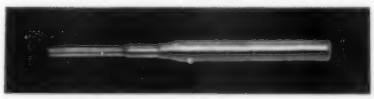
DIVISION OF RELIANCE ELECTRIC AND ENGINEERING CO.

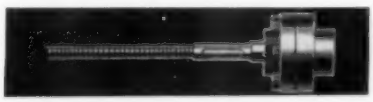

HONEYWELL



One basic TEL-O-SET transmitter serves all applications

TEMPERATURE SENSING ELEMENT has small bulb for fast response. Either plain or coiled bulbs are standard, with or without union connections. For food processing applications, bulb is available with union connection for Type 3A4 sanitary fitting.





PRESSURE SENSING ELEMENT—a sealed volumetric pressure unit with stainless steel diaphragm and flange protects the transmitter from corrosive material, and damps line pulsations.

- Measures temperature, gage pressure or absolute pressure.
- Requires only one thermal system and one pressure system for all ranges. Changeover from temperature to pressure measurement is extremely simple.
- Span can be shifted to cover any part of the overall transmitter range—from 40 to 600 psi, or from –375 to 1000°F—*without changing or adding parts.*
- Equally accurate at small spans of 20 psi and 50°F or at wide spans of 150 psi and 400°F.
- High-speed response to temperature or pressure changes permits control within close tolerances.
- Ambient temperature and pressure compensated. Vibration resistant.

Get complete details on *Tel-O-Set* transmitters . . . and related *Tel-O-Set* miniature indicators, recorders and controllers . . . from your nearby Honeywell field engineer. Call him today . . . he's as near as your phone.

MINNEAPOLIS-HONEYWELL REGULATOR CO., *Industrial Products Group*, Brown Instruments, Wayne and Windrim Avenues, Philadelphia 44, Pa.

● **REFERENCE DATA:**
Write for Specification S1003-1

Honeywell

H HONEYWELL

First in Controls

Anti-lock prevents relative rotation between anchor cage and tubing while running

Re-latch threads prevent upper slips from setting until ready.

Long, flexible drag springs allow easy recovery in case of washover.

Special seal protects against fouling from sand or scale.

Internal shoulder creates a differential piston inside rubber to cause a tighter seal.

Full setting force is transmitted to packing element through lower head. No scrubbing action between lower slips and casing wall during setting stroke.

Guiberson
permanent completion

TYPE A DRILLABLE PACKER

runs and sets easily, quickly

- ***Built-in safety against premature setting***
- ***Set and produce in ½ tubing trip***
- ***Unequalled rubber seal***

Guiberson Type A Drillable Packer gives you a versatile packer for many uses..single or multiple zone production, acidizing, pressuring operations, water-flooding, testing, corrosion control and many others.

New safety factors against premature setting are provided since the transmitting of drag from tight casing or impact from junk is direct to the tubing string.

The Type A can be set and placed in production with only ½ tubing trip. Spacing problems are easier, especially when run in combination with a multiple zone packer. From rig floor to completion, the Type A runs and sets faster than any other permanent packer.

Guiberson superior quality rubber and special lead-alloy thimbles compress fully for a leak-proof seal. Setting is quick, easy and uncomplicated..may be set by wire line. Available in 5" through 7⅝" sizes for 2" or 2½" tubing with a full line of stingers and accessories. Ask your Guiberson representative for a recommended installation or write for full details.

THE GUIBERSON CORPORATION

ESTABLISHED 1919
DALLAS, TEXAS
U. S. A

Sold by
Oil Field Supply Stores
Everywhere

New HEAVY-DUTY INTERNATIONAL V-8's

TRUE TRUCK TORQUE
TRUE TRUCK ECONOMY

Greater Gasoline Economy

All-Truck INTERNATIONAL heavy-duty V-8 engines with *True Truck Torque* combine short stroke with low engine rpm. The result: less engine friction and drag. More working power is released *from* the engine, less gasoline is required to maintain it.

More Usable Power at the Wheels

Efficient engine power doesn't pay off until it reaches the wheels. Heavy-duty INTERNATIONAL V-8 Truck transmissions and axle ratios convert low engine rpm into extra-payload hauling power at the wheels where it counts. That's *True Truck Torque!* There's more "go" with more economy because engine, transmission and axle are balanced to match truck, traffic, terrain and job *exactly!*

Longer Engine Life

INTERNATIONAL heavy-duty V-8's combine rugged, all-truck design with big 401, 461 or 549 cubic inch displacements to develop full horsepower without life-shortening stress or strain. Exclusive "wet" replaceable valve guides, fully machined combustion chambers and other endurance features cut your maintenance costs.

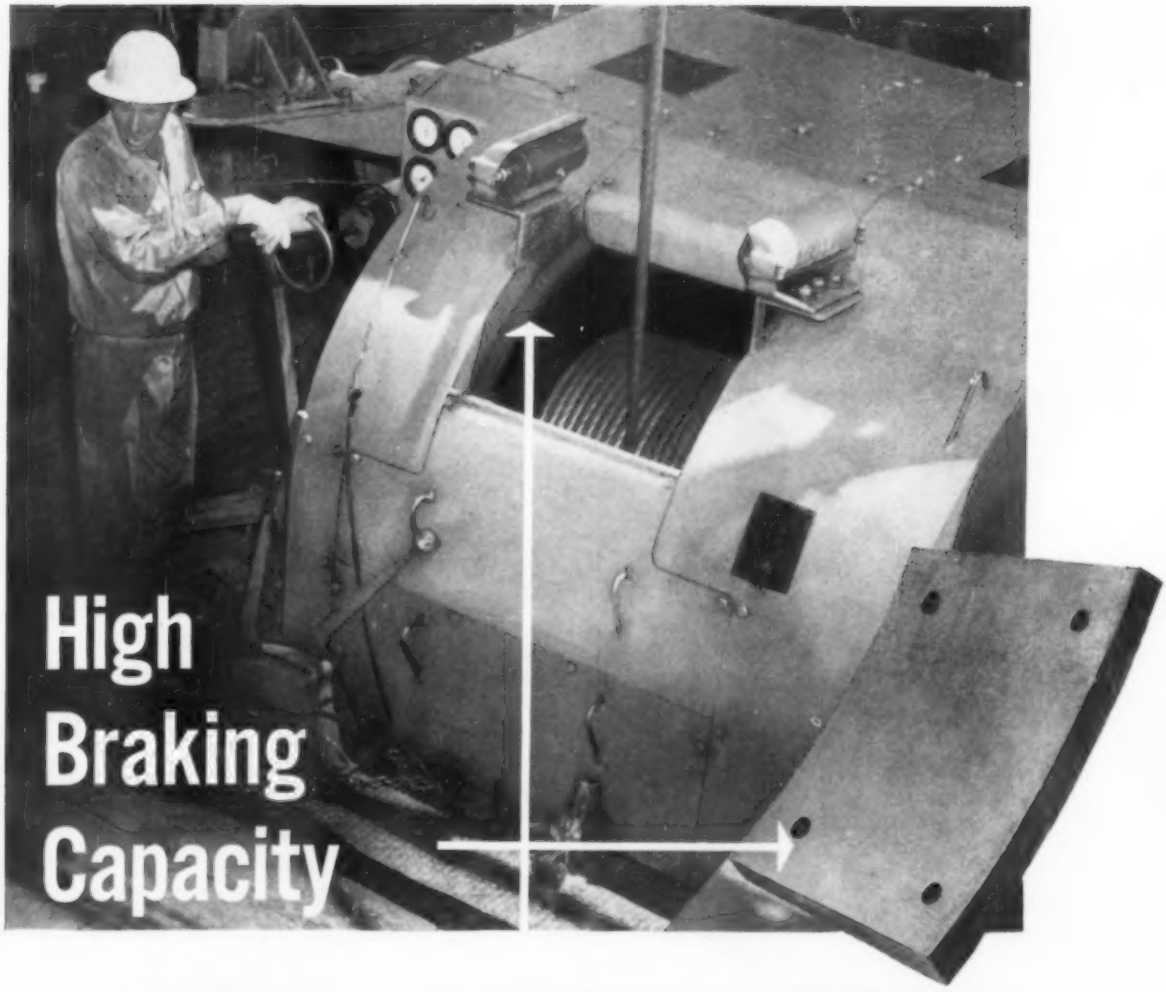
Whatever your hauling problem, there's a heavy-duty INTERNATIONAL Truck with True Truck Torque V-8 engine to handle it. Proof? See the statements of INTERNATIONAL heavy-duty V-8 truck owners who do the same truck job you do . . . at your INTERNATIONAL Dealer!

INTERNATIONAL model V-225 tractor with 549 cu. in. V-8 engine

INTERNATIONAL model VF-192A dump with 401 cu. in. V-8 engine

International Harvester Company, Chicago
Motor Trucks • Crawler Tractors
Construction Equipment • McCormick® Farm Equipment and Farmall® Tractors

INTERNATIONAL TRUCKS cost least to own!

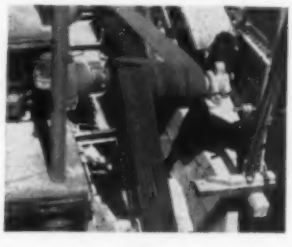


with Thermoid Brake Blocks

Choice of leading original equipment manufacturers and drilling contractors everywhere, Thermoid Brake Blocks withstand highest operating temperatures without crumbling or loss of shape. The solid woven asbestos tape (no plies) assures uniform friction, maximum safety, extra long life. Thermoid's special resins won't bleed or leave residue on drums. Split-type sleeve prevents 'chucking.' Because the braking surface is pre-ground to accurate limits, no 'running-in' is required.

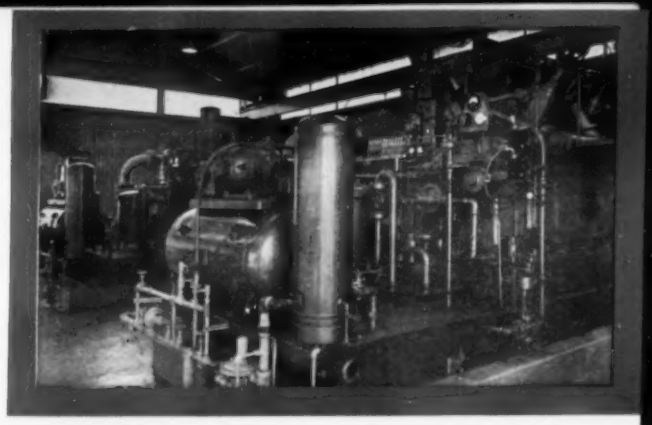
On original equipment, or when you're making replacements, always insist on Thermoid.

Specify Thermoid Powerflex Rotary Hose and Multi-V Belts for rugged oil field service.



Thermoid

Thermoid Company
Offices and Factories
Trenton, New Jersey • Nephi, Utah

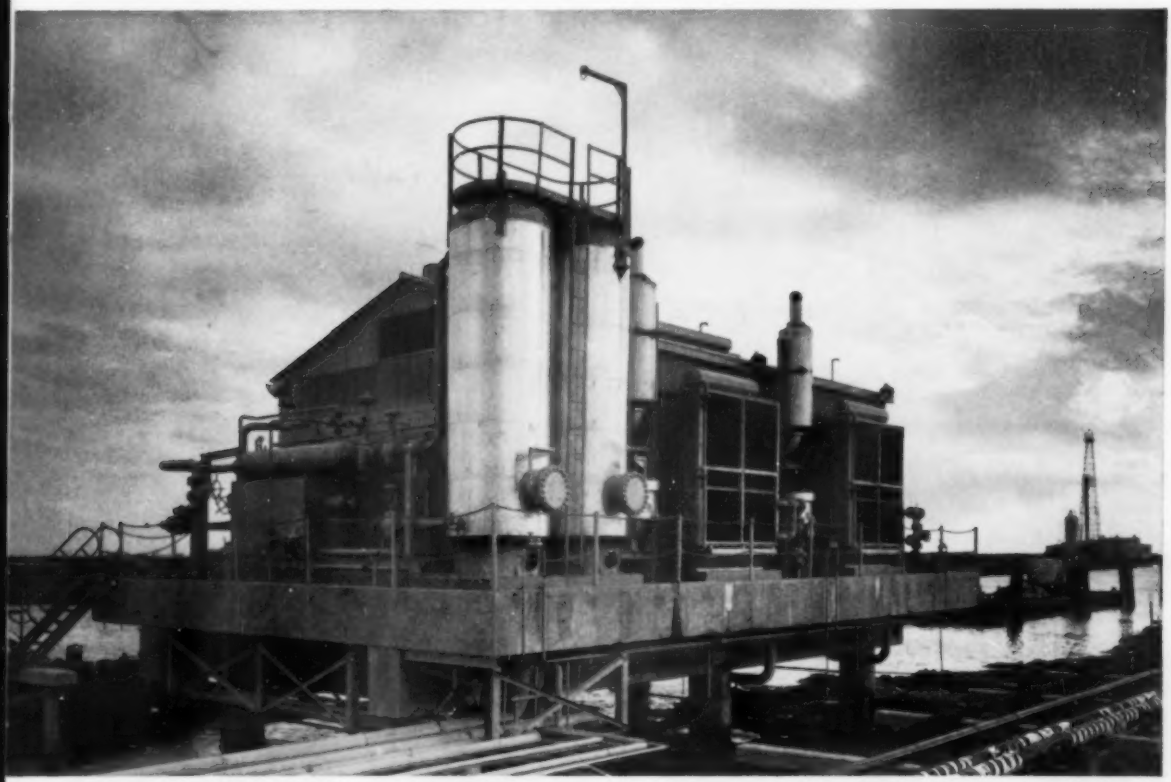


Southwest

PERFECT BALANCE FOR VIBRATION-FREE OPERATION

The perfect balance of these two Cooper-Bessemer GMXD-8 compressors and their packaged components allows them to compress 19 million cubic feet per day from 350 to 900 psi—vibration-free. Southwest Packaged Gas Compressors can be installed in any location to do any compressing job. They can be mounted on piling, pre-stressed concrete platforms, barges or wherever necessary for most economical installation and operation.

The unattended operation, possible with the automatic controls and safety devices on Southwest Packaged Compressor Plants, cuts operating costs per horsepower-hour to a fraction of the cost of a fully attended stationary installation. A Southwest engineer can show you actual comparative operating costs. Available in sizes from 265 h.p. to 660 h.p.



Shell Oil Company — South Pass, Louisiana

FOR GAS LIFT, GAS BOOSTER, PRESSURE MAINTENANCE AND SIMILAR PROJECTS.

SOUTHWEST INDUSTRIES, INC.

P. O. Box 19392, Houston 24, Texas

NEW AMERICAN IRON

EXCLUSIVE FEATURES OF THE NEW AMERICAN IRON KELLY DRIVE

8 SELF-ALIGNING ROLLERS

Four caged roller units (8 individual rollers) pivot at the cage base pins to allow for nominal amount of kelly misalignment without introducing a bending motion in the kelly. These cage rollers also allow a nominal amount of misalignment of the crown block with the rotary table and still maintain alignment of the kelly with the kelly bushing.

POSITIVE LUBRICATION OF ALL 8 ROLLERS

All rollers are lubricated directly. There is no indirect lubrication system to become clogged and endanger both bushings and pins. All bearing areas have grease cavities for reserve grease. No special grease is required.

35 YEARS EXPERIENCE ENABLES AMERICAN IRON & MACHINE WORKS CO.

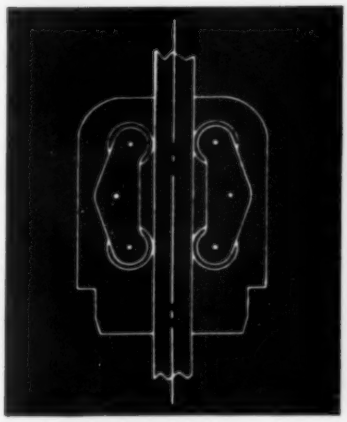
KELLY DRIVE-BUSHING...

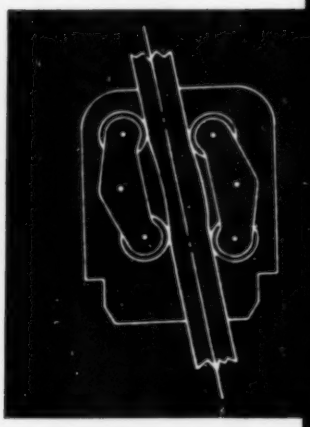
eliminates damaging kelly whip and gyration!*

* Resulting from misalignment of rotary table or crooked kelly.

FOR THE FIRST TIME...

a kelly drive-bushing with pivoted-cage rollers which are self-aligning with the kelly!





New, Exclusive Pivoted-Cage Roller Design greatly increases life of all rotating parts!

SELF-ALIGNING . . . the pivoted-cage rollers in the new American Iron Kelly Drive-Bushing actually compensate for the small crooks and bends in the kelly! Now—for the first time—here is a kelly drive-bushing that assures centered kelly rotation above to the swivel . . . and below to the drill string! Unlike other multiple-roller kelly drive-bushings, the new American Iron kelly drive-bushing does not cause damaging whip and gyration movement to be transmitted to the crown block and below to the drill string!

American Iron's exclusive, self-aligning, pivoted-cage roller design increases the life of ALL drill string members many times! Get all the facts now from your American Iron Representative or your Supply Store man. Don't settle for less than the best. Specify the new, American Iron Kelly Drive-Bushings on YOUR rigs!

Accurate Fit Without Adjustment at Rig!

There are no adjustments to make, no shims to put in or take out when installation is made on the kelly with the new American Iron Kelly Drive-Bushing. It helps the crew hold down-time to a minimum when changing kellys.

Contact your Supply Store, now!

Another AMF Product
PETROLEUM EQUIPMENT

AMERICAN IRON & MACHINE WORKS COMPANY, INC.
518 North Indiana Avenue • Oklahoma City, Oklahoma
Subsidiary of AMERICAN MACHINE & FOUNDRY COMPANY

AMERICAN IRON & MACHINE WORKS CO., INC. · MANUFACTURERS OF OILFIELD EQUIPMENT · A · OKLAHOMA CITY ·

BUSHING GUARANTEE YEARS-AHEAD PERFORMANCE!

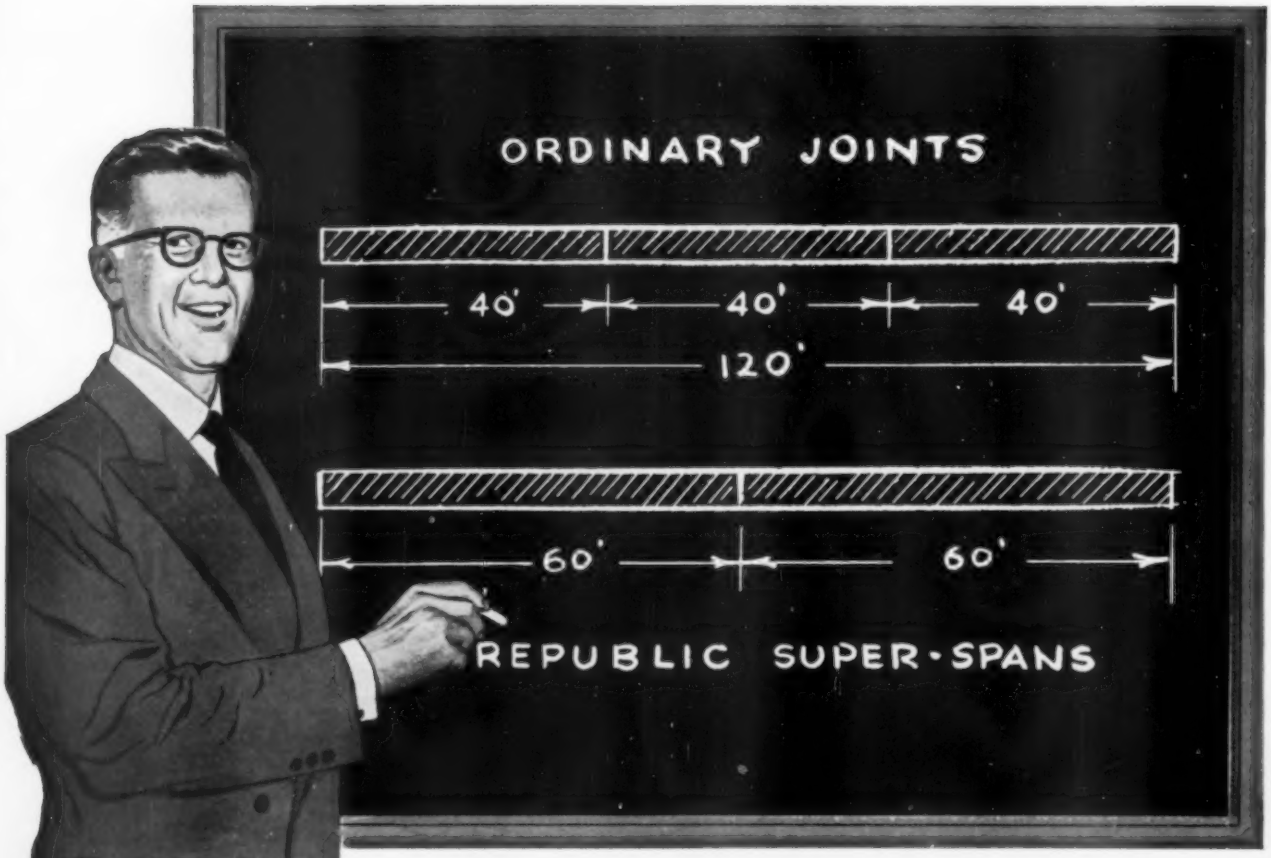
FRICTION-FREE KELLY FEED OFF

In addition to self-aligning feature, extra large size rollers are used to assure sufficient bearing area on the kelly. These smooth-running, friction-free driving rollers will not bind or hang up on the kelly as the driving pressure between the rotary table and string increases.

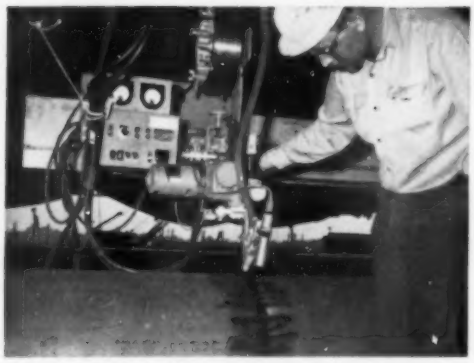
INTERCHANGEABLE ROLLERS FIT VARIOUS SIZE KELLYS

Interchangeable cage rollers adapt the American Iron Kelly Drive-Bushing to 3", 3½", 4¼" and 5¼" square kellys simply by changing roller diameters. Tapered rollers adapt the bushing to 4¼" and 5¼" hexagon kellys. Pins, bushings, entire cages can be removed or replaced with tools available on every rig. There are no adjustments to make at the rig, no shims to put in or take out when installation is made on the kelly.

TO PROVIDE YOU WITH THE FINEST OF DRILLING AND PRODUCTION TOOLS!



HIGH-QUALITY FACTORY WELD joins two 30-foot lengths of Republic Fusion Weld Line Pipe to produce 60-foot "SUPER-SPAN" joint. Here, perfect line-up is assured by rubber-tired support rollers as stringer bead is applied.



"SUPER-SPAN" JOINT IS COMPLETED in two passes by this fully automatic submerged-arc welding machine. Weld is as sound as longitudinal weld. Resulting length is 50% longer than ordinary 40-foot joint. Send coupon for complete data.

REPUBLIC

REPUBLIC STEEL

World's Widest Range of Standard Steels

ELIMINATE *1 out of 3* FIELD WELDS

With Republic Fusion Weld Line Pipe "SUPER-SPAN" Joints

By direct comparison, two Republic "SUPER-SPAN" Joints of fusion weld line pipe cover the same distance as three conventional joints. This means when you install "SUPER-SPAN" you can eliminate every third field weld!

Savings in field construction time are obvious. One-third less field welds are required, which means that field welding crews move ahead faster—and lay 50% more footage with the same manpower.

Beyond savings in time and money, Republic's exclusive "SUPER-SPAN" Fusion Weld Line Pipe Joints provide end-to-end uniformity to assure interruption-free laying. Over the years, Republic's 30-foot joints have built an enviable reputation for consistent diameter and wall thickness. Laying crews can line up joints fast and accurately—complete field welds with maximum speed, unhampered by costly burn-throughs due to thin spots. Further, uniform high ductility and yield strength of Republic Fusion Weld facilitates field bending and provides unexcelled dependability in high-pressure service.

Now, "SUPER-SPAN" combines all of these advantages plus the economy of 60-foot joints. The manufacturing process employs the latest approved welding technique. Two 30-foot lengths are joined under controlled conditions by automatic submerged-arc welding equipment. Completed girth weld is as reliable as the longitudinal weld itself.

Republic is a leading producer of pipe for every oil and gas handling application. For full information, contact your local Republic office or mail coupon.

ELIMINATE CORROSION PROBLEMS in a wide variety of oil and gas handling applications with Republic Plastic Pipe. Republic produces a complete range of sizes in SRK (Semi-Rigid Kralastic), SRB (Semi-Rigid Butyrate) and FE (Flexible Polyethylene). Plastic piping is light and easy to use. Send for facts.

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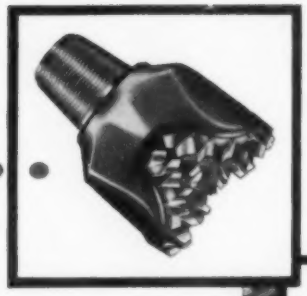

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The Spring is the thing !

Byron Jackson oil tool experience

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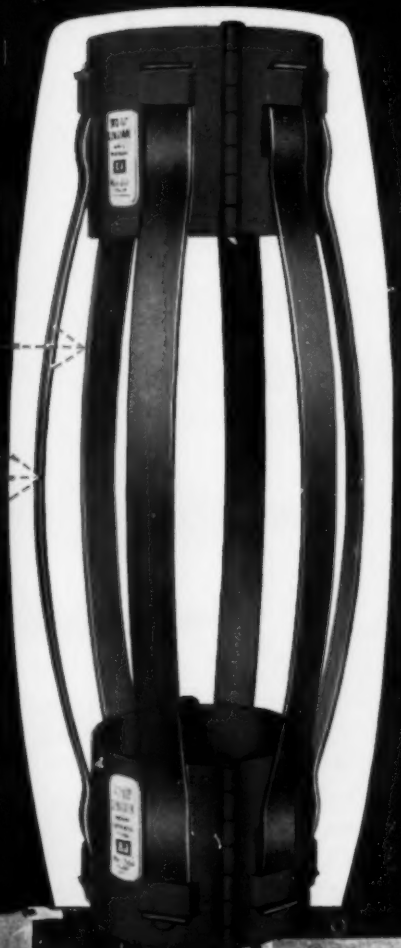

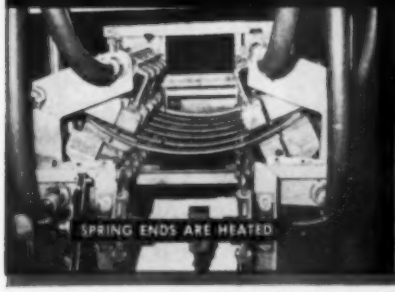

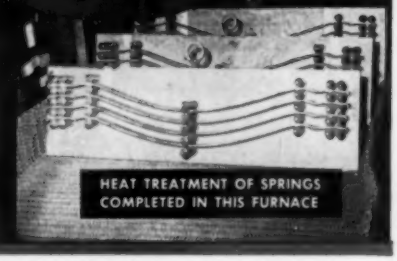

The Borg-Warner Spring Division assembly line... quality control in centralizer manufacture.

More than two years of research by BJ and Borg-Warner now bring you the ultimate in a scientifically designed and manufactured casing centralizer—the BJ Red Top! Its exclusive pre-stressed springs are held in place by their own tension. There are no welds to fail—no rivets to pop. Pre-stressing gives you dynamic centralizing power within a slim overall design. You'll get a better cementing job every time with BJ Red Top Centralizers.

See your oil field supply dealer or your local Byron Jackson Tools or BJ Service field salesman.

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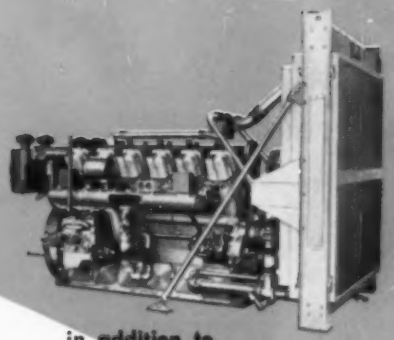
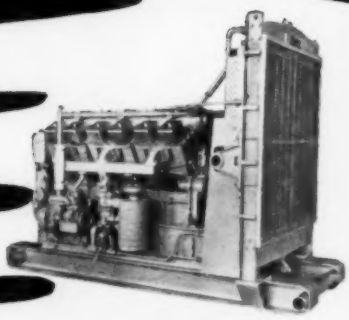
. . . and parts and service



in addition to

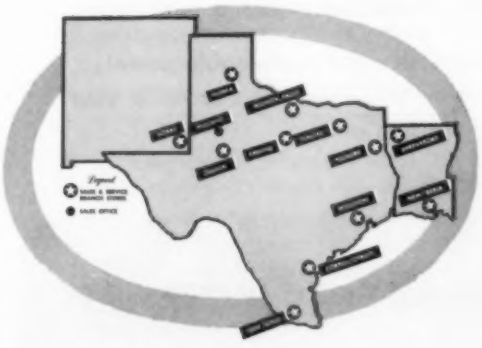
Waukesha

and all other present equipment lines



● Waukesha Motor Company has recently purchased the Climax Engines Manufacturing Company. Waukesha Sales & Service, Inc. will handle both lines throughout our present sales and service territory.

The addition of Climax gas engines, ranging up to 600 horsepower, enables us to offer engines for services requiring power capacities intermediate between the ratings of many of our existing models.



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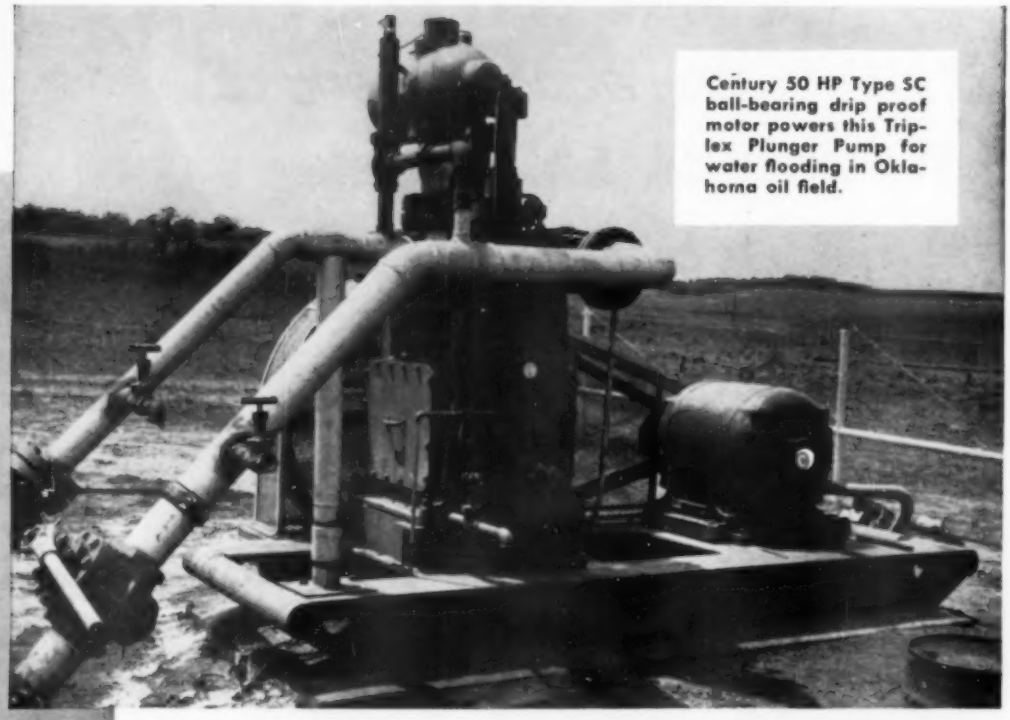

Century 50 HP Type SC ball-bearing drip proof motor powers this Triplex Plunger Pump for water flooding in Oklahoma oil field.

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For your oil producing operations, Century has a complete line of Performance-Rated motors. Choose just the right size, speed, torque, and frame for each specific job—no matter how tough the application. They are available with rodent-proof screens where required, and for hazardous atmospheres there are totally enclosed and explosion proof types.

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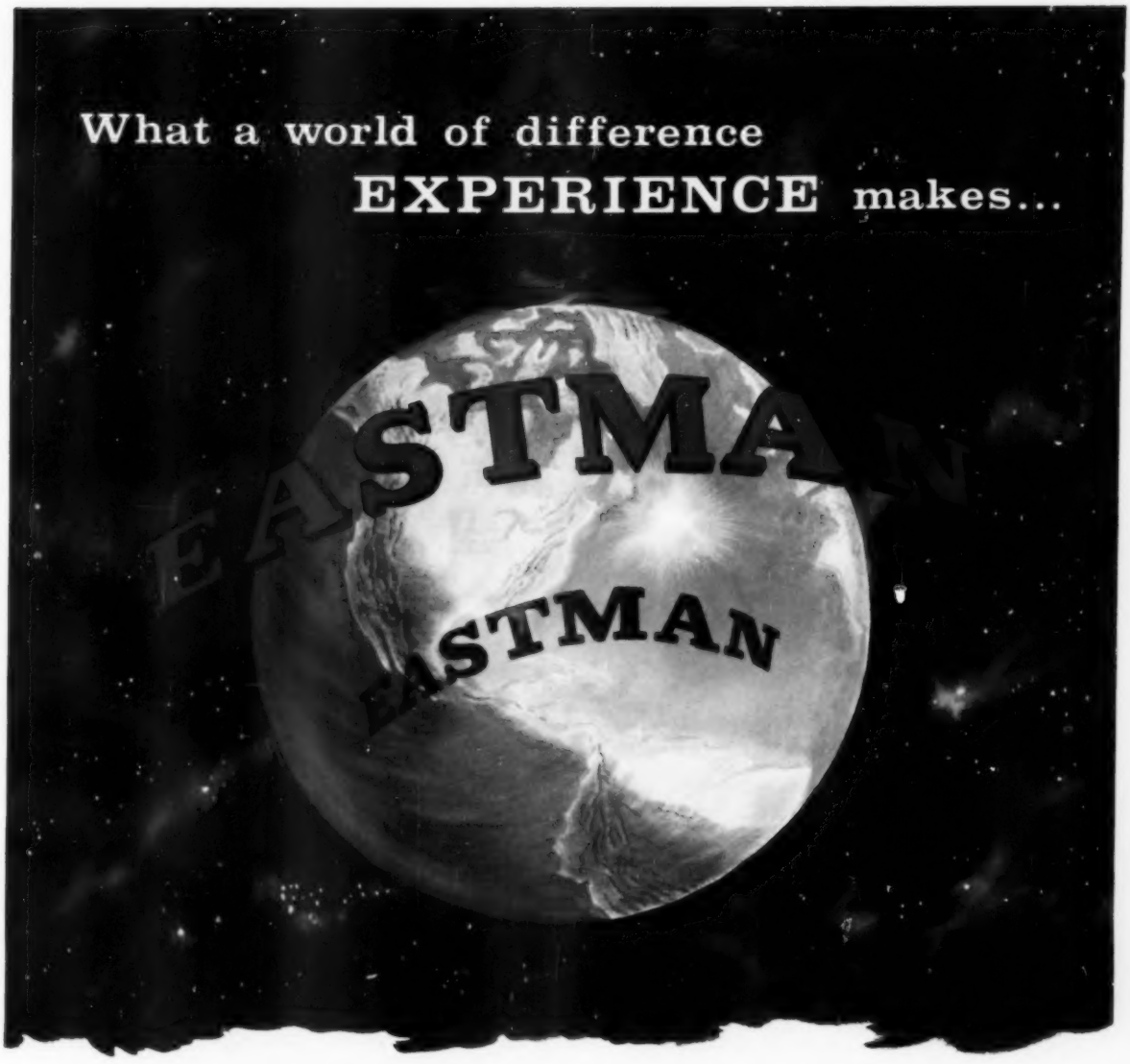
EXPERIENCE makes...



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Eastman experience, advanced instruments, tools and methods make the big difference in efficient drilling operations. Eastman is the originator of *controlled directional drilling . . . sidetracking . . .* as well as the pioneer in well bore hole surveying.

This means that when you need help in your drilling operations you can get dependable, trustworthy and, in the end, more economical assistance from Eastman specialized engineers, techniques and instruments. Call upon Eastman day or night for the finest service with the most distinguished background *anywhere in the world.*

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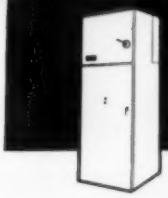
Type H Motor Control



Ultimate in protection

for men and machines

Here's the last word in control protection for personnel and equipment! It's all part of Allis-Chalmers newly designed, high voltage control.

And maximum protection is only one of the features of this new control line. You also get full-front access, smaller cabinet size (2.36 square feet less than competitive units), a completely tested unit, and ample panel space for optional features.

1. Gang-operated disconnect switch isolates starter from incoming power—assures safe entry to high voltage compartments.

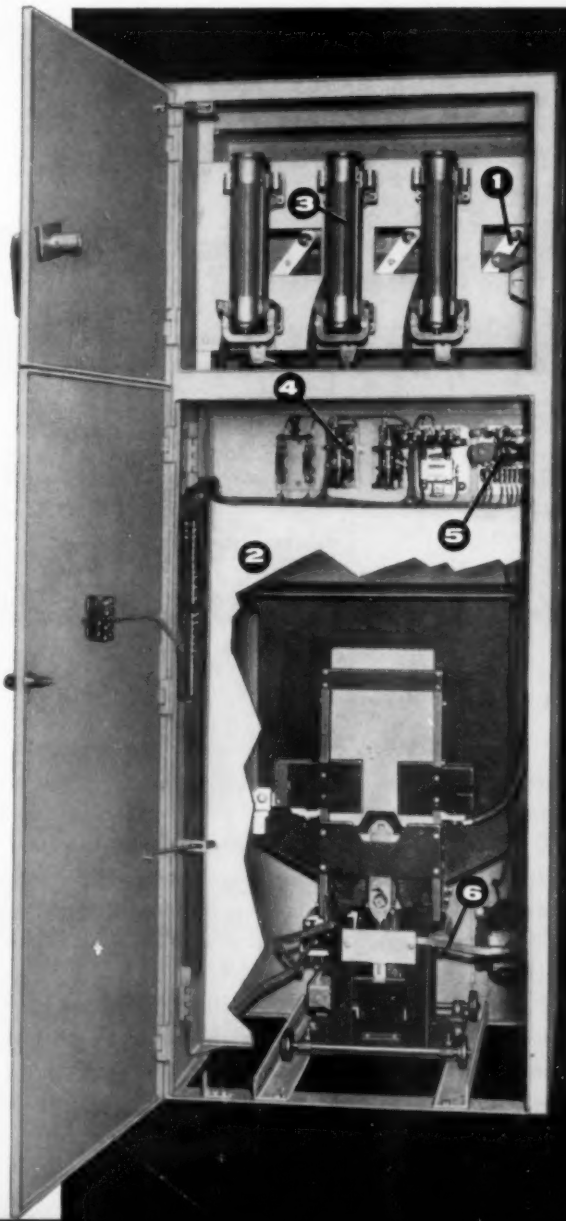
2. Steel cubicle separates high and low voltage equipment.

3. Short-circuit protection provided by fast-acting current-limiting fuses, rated 150,000 kva at 2300 volts and 250,000 kva at 4160 or 4600 volts.

4. Overload protection provided by accurate temperature-compensated thermal overload relays which trip only with excessive motor current, preventing needless motor stoppages.

5. Undervoltage protection instantaneously opens line contactor on loss of voltage. Time-delay undervoltage protection also available.

6. Mechanical interlock coordinates contactor, disconnect switch, outer door and inner control barrier for maximum safety.



This starter line meets every 2300 to 5000-volt motor need. Contact your A-C office, or write Allis-Chalmers, General Products Division, Milwaukee 1, Wis.

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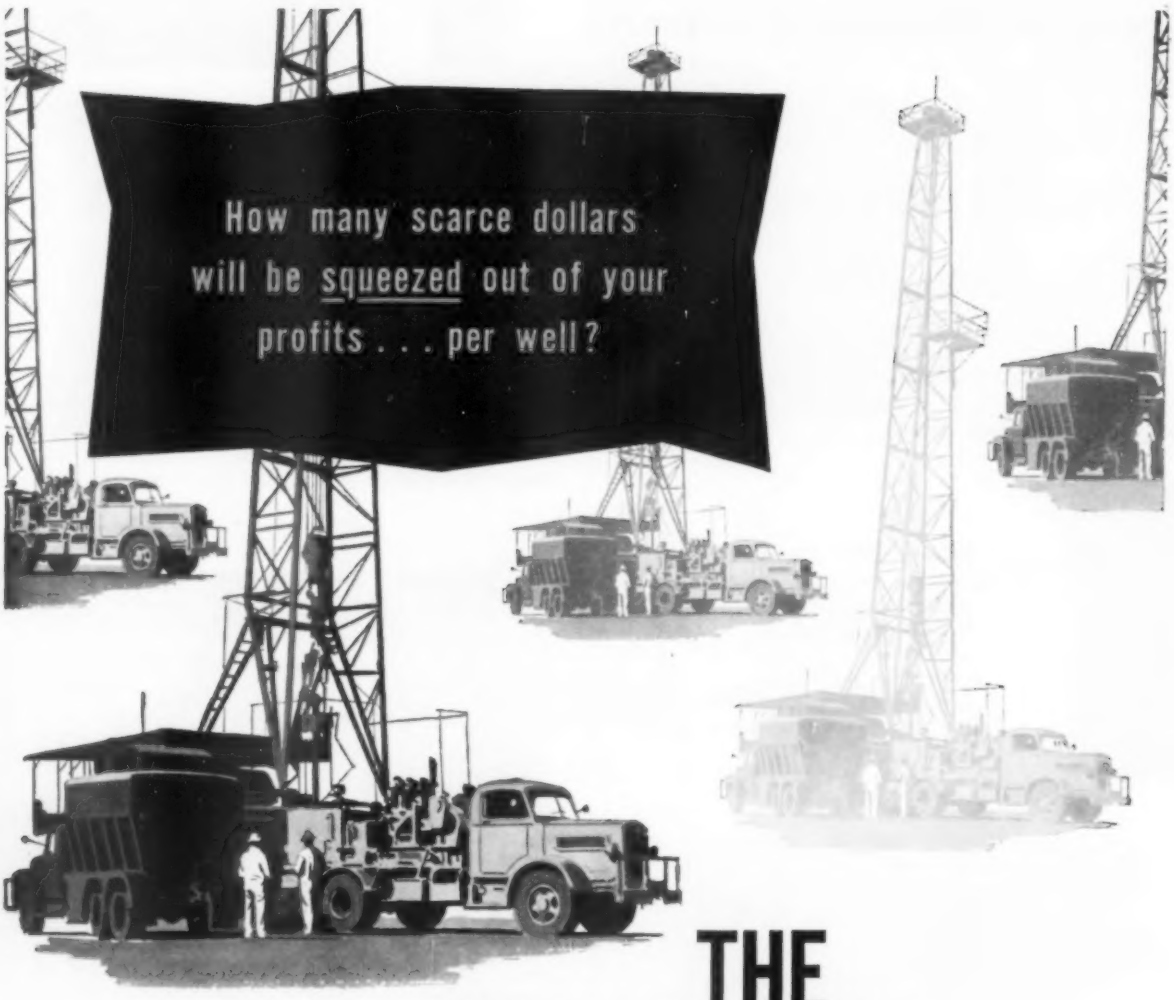
A-5521



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The Weatherford Technique will give you a successful primary cement job—one that is free from the threat of remedial squeezing.

This fact is of great importance to today's operators—faced as they are with increasing costs and shrinking profits. Squeeze jobs, of course, are paid for out of profits. The costs, including loss of time and production, can never be recovered.

The Weatherford Technique eliminates the need for squeezing by assuring a successful cement job the first time. This Technique is being used successfully in hundreds of wells each month.

Well reports and case histories are retained at every field location. Your Weatherford representative will gladly make these available to you.

Talk to your nearest Weatherford representative, or write for literature.

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GENERAL OFFICES: 5920 Navigation Blvd., Houston, Texas

They Say—

Looking at 1958

U. S. Steel

"U. S. Steel is backing confidence in the future economy with nearly $700 million to be spent on authorized projects for additions to and replacement of facilities to keep the corporation prepared to meet anticipated steel requirements of its customers and ready to meet the demands of national emergency.

"Although 1957 was a year in which the actual use of steel may prove to be the greatest in our country's history, it was also a year in which the industry operating rate declined in each successive quarter. With consumption in the beginning and ending quarters approximately the same, the operating rate declined from 96 per cent to 78 per cent . . . It must be considered that steel capacity has been increased sharply since World War II, a development which has distorted year-by-year comparison on a basis of the operating rate. Therefore, any comparison of steel production in these days of increasing capacity is most informative when computed on a tonnage basis.

"The seeming paradox between lowered production and high consumption lies in the marked impact of the recent consumer use of inventory stocks rather than mill or warehouse deliveries.

"Early in 1957 steel users were adding between 10 and 15 per cent of steel receipts to stocks, both in the form of steel products—plates, sheets, strip—as well as in the form of material in the industrial pipeline, including parts and subassemblies.

"It was late spring before over-all accumulation of inventories ended. The reversal in customer inventory policy from building to reducing continued through the remainder of 1957, resulting in steady reductions in the steel shipments despite sustained high consumption. In recent months steel shipments have fallen approximately 10 per cent below actual consumption, as the equivalent of six million ingot tons was cut out of stocks during the second half of 1957. With an inventory change of this magnitude, it was inevitable that a sharp cut in the operating rate would result.

"Steel inventory movements will continue to be a dominant considera-

You don't swallow this "tranquilizer" . . . but it can bring you priceless peace of mind! It's the rupture disc in a BS&B Safety Head—one of thousands upon thousands that protect personnel and equipment against dangerous pressure build-ups in vessels and lines containing air, gases or liquids.

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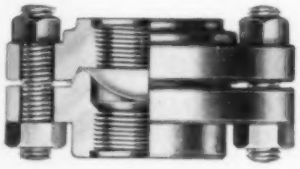
BS&B SAFETY HEADS protect pressure systems in every type of industry

Thousands of BS&B Safety Heads have been in use for the past 26 years in virtually every type of industry where pressure protection is a problem. If your responsibility includes the *safe* operation of pressured systems in your plant, why not let us tell you more about BS&B Safety Heads?



BS&B — OVER 60 YEARS — EFFICIENCY RELIABILITY — ANOTHER EXAMPLE OF PRODUCT LEADERSHIP

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tion in evaluation of the outlook for steel in 1958.

"Our estimates of national output and steel consuming industry activity during the first half of 1958 indicate that total steel use will show some decline from the record pace of 1957. But of greater significance, it is probable that inventory cutting will be maintained well into 1958, with a continued restraining effect on steel production. Because of these considerations, steel output in the first half of this year may be little changed from the leve's of recent weeks.

"It is important to understand, however, that steel taken out of consumers' stocks is likely to be replaced at some point. Inventory liquidation carries with it the regenerative seed for renewed vigor in steel output when inventory building inevitably commences, reinforced by the longer term growth potential of our economy. Consequently, there is reason to expect a pickup in steel output engendered by renewed inventory building, following the current inventory liquidations."

Statement of Roger M. Blough, chairman, U.S. Steel Corp.

BP Canada

"At a time of great and justified optimism in the future growth of Canada and its oil industry, the year 1957 was a period of tight money and reduced markets for Canadian crude. It is obvious that the economy is in the midst of a period of adjustment. The year 1958 can be expected to reflect a pause for stabilization with a volume of business which may be only slightly above that of 1957.

"It is certain, however, that the petroleum industry can be relied on to go forward steadily with its plans, and in so doing lay the foundation for further advances in the expectation that the long-term future prospects are still as bright as ever.

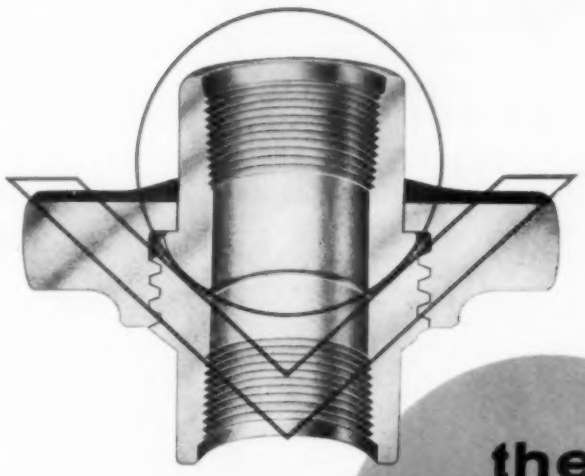
"We are continuing with our plans for continued and further participation in the Canadian oil picture, in western Canada in exploration and production, and in the East in marketing and refining."

A. F. Down, president, BP Canada, Ltd., and BP Exploration (Canada), Ltd.

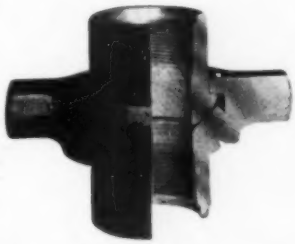
Imperial Oil

"Despite some surpluses in the world petro'eum picture in late 1957, the Canadian oil industry produced about 7 per cent more crude and sold about 5 per cent more products than

with WECO UNIONS



the SECRET'S in the SEAL



● If there's any secret to the success of WECO Unions, that secret lies in the perfect seal they always produce.

For WECO Unions incorporate a fundamentally correct ball and cone design which prevents leaks under high pressures, shock, surge or vibration. The spherical seat of the male sub always forms a perfect metal-to-metal seal against the conical surface of the female sub.

WECO Unions have great durability, as a result of stronger subs and wing nuts, heavier wall construction and sturdy Acme threads. They can "take it" on the toughest jobs, and maintain their efficiency under extremes of pressures, volumes and abrasions.

WECO Unions are available at supply stores everywhere, in sizes from 1" through 12", in pressures from 1,000 through 15,000 psi.

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The International Petroleum Exposition is planning in 1959 for the largest exhibition in its history of equipment, services and methods used in providing the oil products needed in our modern world. More exhibit space is being provided to meet the demands of exhibitors and prospective exhibitors.

Special emphasis in the Hall of Science will be put on the observance of the 100th anniversary of the drilling of the first well in the United States at Titusville, Pennsylvania in 1859.

With the dates set in conjunction with the World Petroleum Congress (to be held in New York City a week after the Tulsa event) the largest attendance of oil men and official delegates from oil producing nations of the world is expected.

Write for information on exhibit space or any other data desired, to International Petroleum Exposition, Box 5205 Donaldson Station, Tulsa, Oklahoma, U.S.A.

W. K. Warren, President
Wm. B. Way, General Manager

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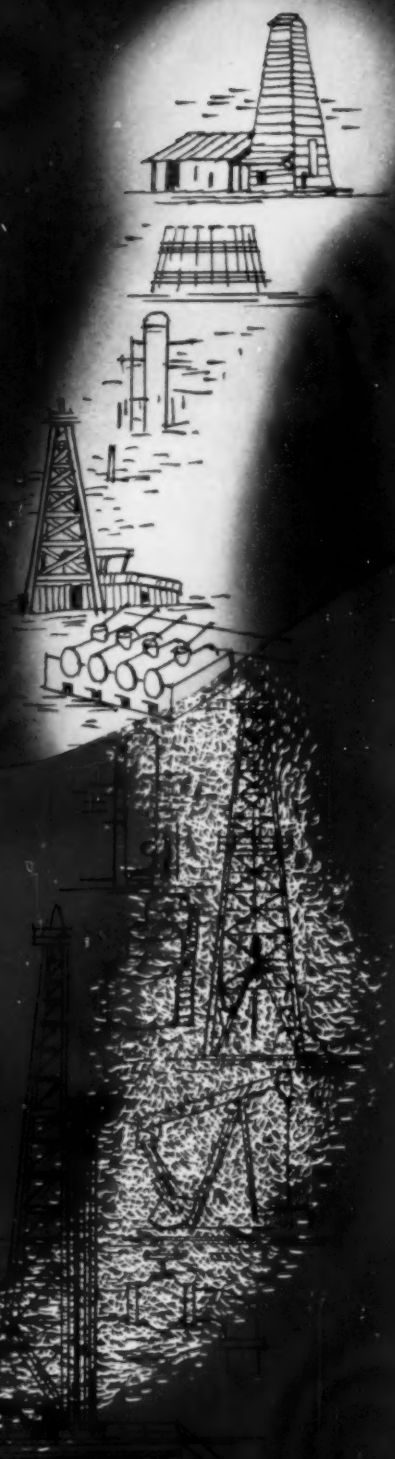
1959

TULSA, U.S.A.



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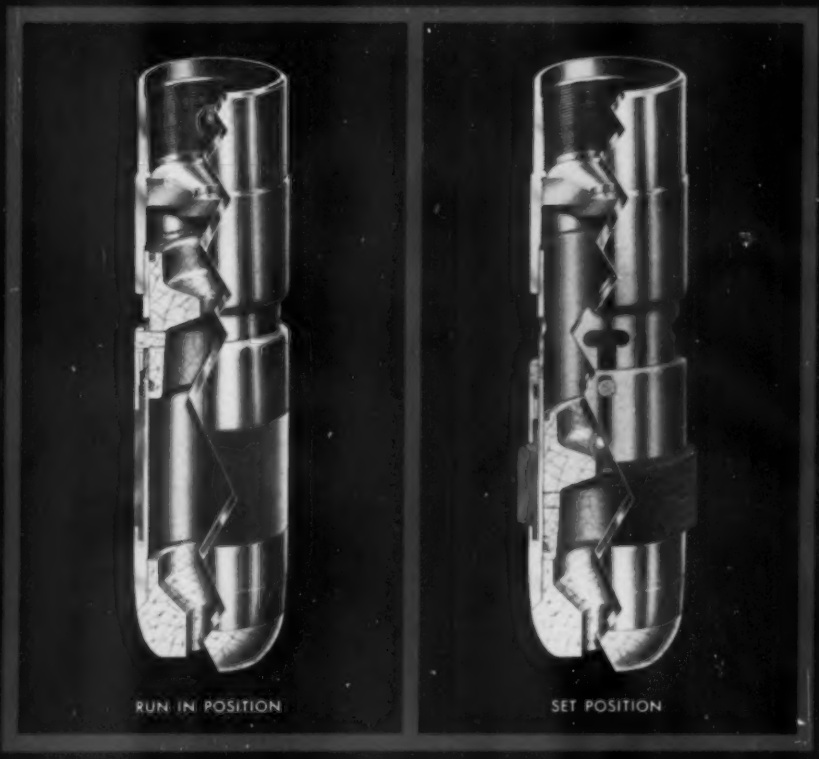

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in 1956. We expect a continuing high level of activity in 1958.

"With the completion this year of the Interprovincial Pipe Line to the Toronto area and expansion of refineries there, the demand for Canadian crude oil should show a substantial growth during 1958 . . .

"New chemical plants will open in 1958, reducing Canada's dependence on imports for a considerable volume of chemicals derived from petroleum. . . ."

J. R. White, president, Imperial Oil, Ltd.

Jersey Standard

"In 1958 we look for new high levels of demand for petroleum products world-wide, but again expect that rates of increase will be lower than the postwar average, probably around 1½ per cent in the United States, and averaging 8 per cent for foreign countries. . . .

"Our own economists, as well as others in industry and Government, feel that this contraction will not be severe or prolonged. They look forward to a healthy recovery to be under way before the end of 1958 . . ..

"The expenditures the company and its affiliates have made in recent years for capital investment and in the search for oil and gas put us in good shape to meet these increased demands for petroleum. While 1958 will continue to present problems of excess supply and some price weakness, we view the longer range outlook with complete confidence that we are in a growth business. . . ."

Eugene Holman, chairman, Standard Oil Co. (N.J.).

Federal outlook changing?

"The need for greater industry unity and cooperation has been expressed widely in recent months. I, for one, believe we have gone far in creating greater industry unity . . . This has resulted in better understanding of our industry and its problems than ever before.

"While our problems are both serious and numerous, I believe the opportunity for their solution is better because the atmosphere in Government has changed. Government has recognized that our problems are real, not imaginary . . .

"When Government thus attempts to understand and deal with our problems, I believe we have a reason to be encouraged, and, if you please, optimistic.

"This does not mean that we can become complacent. To the contrary, most of the progress we have made

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wherever weeds and grasses are a FIRE HAZARD!

Your "grassing" costs can drop as much as 80% when you use this weed killer! Savings in man-hours alone can be impressive when you consider that year-long results come from just one easy, DRY application of powerful Concentrated BORASCU. This granular, inorganic herbicide **destroys** most vegetation and **prevents regrowth** for long periods because it **remains active** in the root zone; satisfactorily meets all your requirements for safety.

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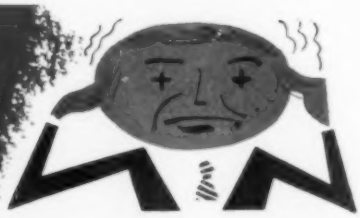

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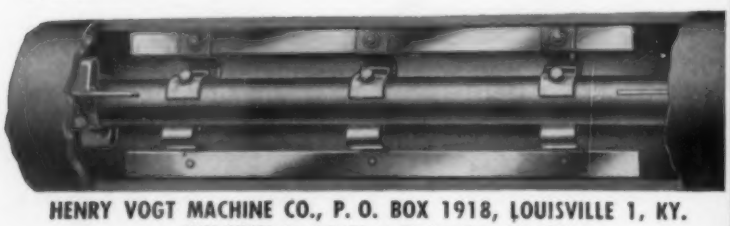

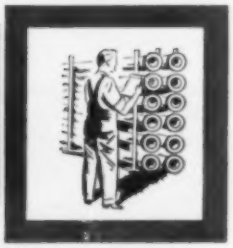

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Robert L. Wood, past president, Independent Petroleum Association of America, in a speech to the Kansas Independent Oil and Gas Association.

CALENDAR

JANUARY

16-18 Association of Oilwell Servicing Contractors, second annual convention, Baker Hotel, Dallas.

19-22 Pipe Line Contractors Association, tenth annual convention, Boca Raton Hotel and Club, Boca Raton, Fla.

20-21 Compressed Gas Association, Inc., forty-fifth annual meeting, Waldorf-Astoria, New York.

21 Indiana Oil and Gas Association, American Petroleum Institute Illinois Basin chapter, joint winter meeting, McCurdy Hotel, Evansville, Ind.

24 Southern Gas Association, transmission section roundtable conference on pipeline engineering, Hilton Hotel, El Paso, Tex.

29-31 Ninth annual Institute on the Law of Oil and Gas Taxation, sponsored by Southwestern Legal Center, Dallas.

31 Natural Gasoline Association of America, regional meeting, Skirvin Hotel Oklahoma City.

FEBRUARY

3-4 Instrument Society of America, chemical and petroleum industry symposium on progress and trends in chemical and petroleum instrumentation, Hotel Du Pont, Wilmington, Del.

5-6 Western Petroleum Refiners Association, Gulf Coast regional technical-industrial relations meeting, Ben Milam Hotel, Houston.

12-14 National Association of Corrosion Engineers, Tulsa section, ninth annual corrosion short course for pipeliners, Mayo Hotel, Tulsa.

13-15 National Society of Professional Engineers, spring meeting, Michigan State University, East Lansing, Mich.

16-20 American Institute of Mining, Metallurgical, and Petroleum Engineers, annual meeting, Hotel Statler, New York.

20-22 Pipe Line Contractors' Association of Canada, annual convention, Empress Hotel, Victoria, B. C.

26-28 American Petroleum Institute, Division of Production, southern district meeting, Shamrock-Hilton Hotel, Houston.

28 Natural Gasoline Association of America, Permian basin regional meeting, Lincoln Hotel, Odessa, Tex.

MARCH

3-4 Society of Petroleum Engineers of American Institute of Mining, Metallurgical, and Petroleum Engineers, fourth annual joint meeting of Rocky Mountain petroleum sections, Cosmopolitan Hotel, Denver.

5-6 Gas Conditioning conference, sponsored by the University of Oklahoma, Oklahoma Memorial Union Building, Norman, Okla.

7 Ohio Oil and Gas Association, winter meeting, Deshler Hilton Hotel, Columbus, Ohio.

10-13 American Association of Petroleum Geologists and Society of Economic Paleontologists and Mineralogists, forty-third annual meeting, Biltmore Hotel, Los Angeles.

12-14 American Petroleum Institute, Division of Production, southwestern district meeting, Hotel Texas, Fort Worth.

17-21 International Atomic Exposition, Inc., 1958 Nuclear Congress, Chicago Amphitheatre, Chicago.

17-21 National Association of Corrosion Engineers, annual conference, civic auditorium, San Francisco.

20-21 New England Gas Association, annual meeting Hotel Statler, Boston.

20-21 Society of Petroleum Engineers of American Institute of Mining, Metallurgical, and Petroleum Engineers, regional conference on production and reservoir engineering, Mayo Hotel, Tulsa.

24-26 Midwest Gas Association, Broadmoor Hotel, Colorado Springs, Colo.

24-26 Western Petroleum Refiners Association, annual meeting, Hilton Hotel, San Antonio, Tex.

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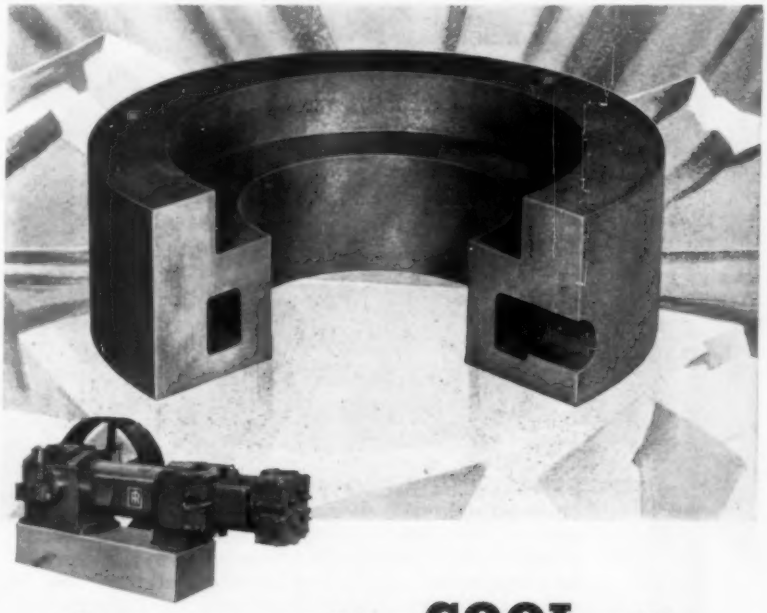

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27-29 American Institute of Mining, Metallurgical, and Petroleum Engineers, Pacific Southwest conference, St Francis Hotel, San Francisco.

31-
April 2 American Petroleum Institute, Division of Transportation, annual pipeline conference, Jung Hotel, New Orleans.

APRIL

1-3 University of Oklahoma, fifth annual conference on corrosion control, Extension Study Center, Norman, Okla.

9-11 American Petroleum Institute, Division of Production, Mid-Continent district meeting, Biltmore Hotel, Oklahoma City.

13-18 American Chemical Society, national meeting, San Francisco.

15-17 University of Oklahoma, thirty-fourth annual gas measurement short course, North Campus, Norman, Okla.

16-18 Natural Gasoline Association of America, annual convention, Baker and Adolphus Hotels, Dallas.

16-18 National Petroleum Association, fifty-fifth semiannual meeting, Hotel Cleve-

17-18 Texas Technological College, fifth annual West Texas oil lifting short course, Lubbock, Tex.

17-18 American Institute of Mining, Metallurgical, and Petroleum Engineers, land, Cleveland.
Louisiana-Arkansas, East Texas, and Mississippi petroleum sections, gas technology symposium, Shreveport, La.

20-23 American Institute of Chemical Engineers and Chemical Institute of Canada, chemical engineering division; Canada-U.S. chemical engineering conference, Montreal.

21-23 American Petroleum Institute, Division of Production, Rocky Mountain district meeting, Cosmopolitan Hotel, Denver.

23-25 Second International Williston Basin Symposium, sponsored by Saskatchewan Geological Society and North Dakota Geological Society, Regina.

27-29 Independent Petroleum Association of America, midyear meeting, Hotel Sherman, Chicago.

27-30 American Association of Petroleum Geologists, Rocky Mountain section, Casper, Wyo.

28-29 University of Oklahoma, third annual conference on automatic control in the petroleum and chemical industries, Oklahoma Memorial Union Building, Norman, Okla.

28-30 Southern Gas Association, annual convention, Dallas.

MAY

5-6 Society of Petroleum Engineers of A.I.M.E., North Texas section, secondary-recovery symposium, Wichita Falls, Tex.

5-7 Purdue University, thirteenth annual industrial waste conference, Purdue Memorial Union Building, Lafayette, Ind.

5-9 American Gas Association, distribution, production, and transmission conference, Roosevelt and Commodore Hotels, New York.

7-9 American Petroleum Institute, Division of Production, eastern district meeting, Deshler-Hilton Hotel, Columbus, Ohio.

8-9 Texas Petroleum Research Committee, eleventh oil recovery conference, symposium on "A Century of Texas Oil, 1875-1975," University of Texas, Austin.

12-14 Chemical Institute of Canada, National Research Council, eighth Canadian high polymer forum, Macdonald College, St. Anne de Bellevue, Quebec.

12-14 Instrument Society of America, symposium of analysis instrumentation division, Shamrock Hilton Hotel, Houston.

12-16 American Petroleum Institute, Division of Refining, midyear meeting, Statler Hotel, Los Angeles.

20-22 Pennsylvania Gas Association, annual meeting, Pocono Manor Inn, Pocono Manor, Pa.

21-23 American Petroleum Institute, Division of Marketing, midyear meeting, Roosevelt Hotel, New Orleans.

22-23 American Petroleum Institute, Division of Production, Pacific Coast district meeting, Biltmore Hotel, Los Angeles.

26-28 Chemical Institute of Canada, annual conference and exhibition, Royal York Hotel, Toronto.

JUNE

8-11 American Petroleum Institute, Division of Transportation, annual tanker conference, Greenbrier Hotel, White Sulphur Springs, W. Va.

19 Pennsylvania Grade Crude Oil Association, annual meeting, Penhills Club, Bradford, Pa.

23-25 Interstate Oil Compact Commission, Lake City.
midyear meeting, Hotel Utah, Salt

22-28 American Society for Testing Materials, annual meeting and exhibit, Hotel Statler, Boston.

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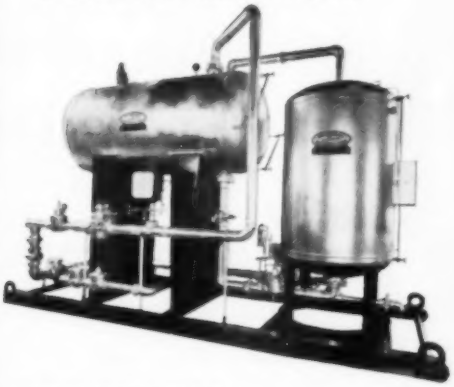

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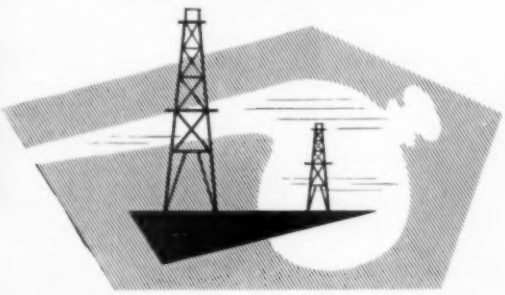

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At Stand after Stand, contractors, designers and specialists in every branch of British chemical and petroleum engineering will have something to show of vital interest.

The Exhibition will also include a conference on "The Organisation of Chemical Engineering Projects" arranged by The Institution of Chemical Engineers and The Institute of Petroleum; and films will show how the Chemical Plant and Petroleum Equipment Industries have helped in the development of their consumer industries.

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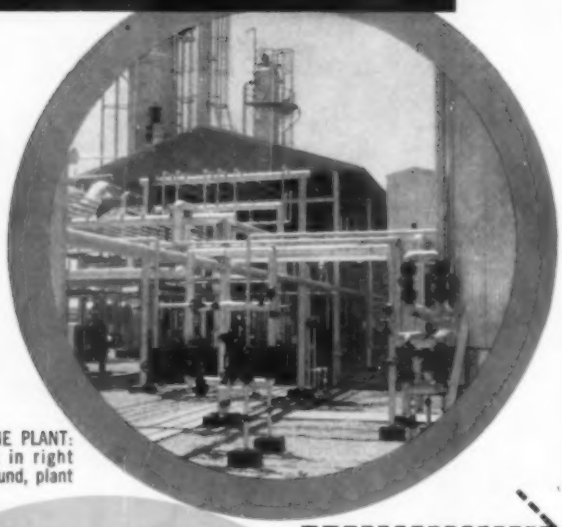
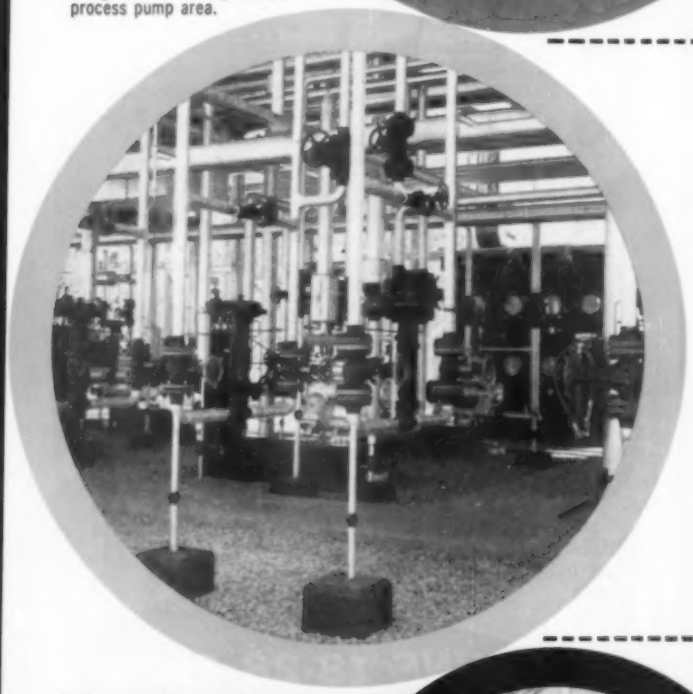
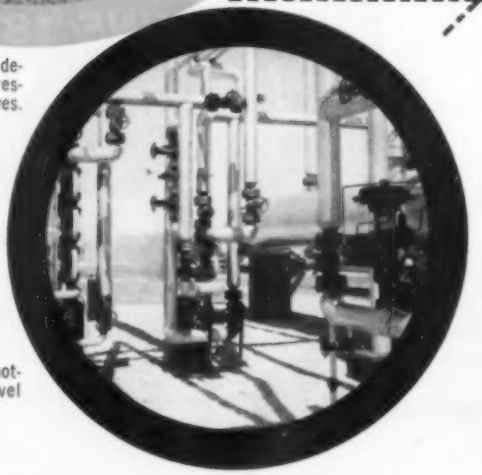


AT A KANSAS GASOLINE PLANT: Propane dehydrators in right foreground. In background, plant process pump area.



In foreground, depropanizer and debutanizer, reflux accumulator pressure relief and level control valves. Reflux pumps in background.



Left to right, de-ethanizer feed, bottoms exchanger, and liquid level control valve.

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TULSA, OKLAHOMA

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JOURNALLY SPEAKING

The Tax that Wasn't

THERE'S an oil situation in Oklahoma which must seem highly amusing to anybody without a direct interest in it and who can stand on the sidelines and view it objectively, though it's quite a serious issue to those involved.

It illustrates the oil industry's problem of improving its public relations, and particularly the problem faced by the API trying to combine its American Petroleum Industries Committee and its Oil Information Committee into a single new Department of Public Affairs.

Last spring Oklahoma's drought was broken by a steady downpour interrupted only by violent cloudbursts. The floods carried out dozens of bridges and damaged scores of miles of highways. The reconstruction job was far beyond the capacity of the state's highway budget.

So the governor proposed and the legislature voted an emergency increase of 1 cent per gallon in the retail gasoline tax. The law said that the tax was to expire January 1, 1958, or earlier if the governor found that it had raised enough money to pay for the flood repairs.

Nobody complained much about this. Motorists accepted it as necessary, though it gave them one of the highest gasoline-tax rates in the nation. Some critics asserted that gasoline taxes always go up and never come down, and predicted that the politicians would find some excuse for continuing this extra cent after the emergency had passed.

The oil industry entered only a mild, proforma protest, more or less just to keep its record straight. The APIC, you know, always has devoted a major portion of its efforts to fighting gasoline taxes and promoting its slogan "Gasoline is cheap; only the tax is high."

Well, the tax went into effect, and what happened? The price of gasoline went down at many service stations in Oklahoma. There were retail price wars almost all over the state. At some stations the price got as much as 6 cents per gallon below what it had been before the tax was raised.

Then, along about the middle of December, Governor Gary announced that he was going to give the motorists of Oklahoma a Christmas present of a reduction of 1 cent a gallon in their gasoline prices by proclaiming the end of the emergency tax on Christmas Eve, 1 week before it was due to expire anyway.

And, boy, you should have heard the oil companies scream! They hollered a lot louder when the tax came down than they did when it went up. They said they had no intention of reducing prices because of the lower tax. They said they had not raised prices when the tax went up, that they had absorbed the tax and had been paying it out of their own pockets all the time instead of passing it on to the motorists. They accused the governor of playing a dirty political trick on them, and putting them on the spot. Apparently they had hoped that the extra tax would expire quietly on January 1 and nobody would notice the difference.

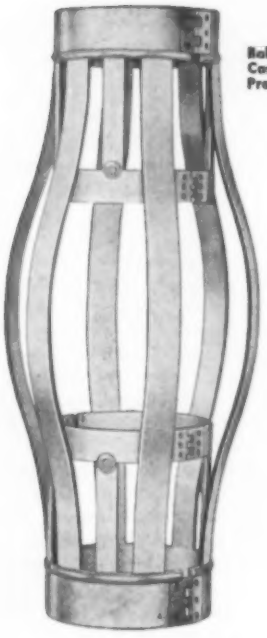
Maybe it was just a coincidence, but anyway the price wars in most of the state were over the day that the tax reduction took effect, and retail gasoline prices went up—at some stations as much as 6 cents a gallon.

There probably is a good explanation for all this, but so far we have not noticed either the APIC or the OIC rushing in to defend the industry and enlighten the public. The leading marketers in the state are furiously protesting that the tax changes and the price changes had no connection with each other, but the chief reaction is some skeptical editorial comment to the effect that every industry always passes on direct taxes to its customers.

Meanwhile, it would not be surprising if a good many Oklahoma motorists are more than ever convinced that oil is a big, bad monopoly that will bamboozle them every time. And it also would not be surprising if a good many politicians don't get the idea that higher taxes on the oil industry won't hurt the consumers at all.

We can't help wondering how the combined APIC-OIC is going to deal with situations like this.

—Henry D. Ralph.



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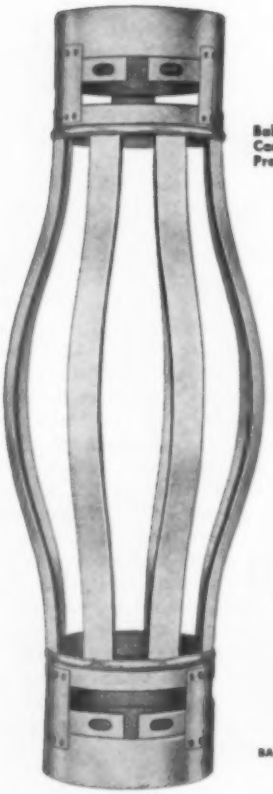

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Oil imports policy should recognize defense realities

THE Government's action in limiting crude-oil imports to the West Coast as a national-defense measure is drawing criticism both in Canada and in the United States.

It is pointed out that Canadian oil is just as accessible, dependable, and defendable as crude from most domestic fields. This is entirely true, due both to geography and to the close economic and military alliance of the two countries.

This points up a weakness in the traditional American foreign-trade policy and particularly in the so-called defense amendment to the Reciprocal Trade Act. Perhaps that weakness can be corrected when the act is up for renewal this spring.

THERE IS A CONFLICT between our historic most-favored-nation policy and the realities of the cold war. We say we must give equal treatment to imports from every source. But there are practical reasons today why we should favor some sources over others.

From a military standpoint it would certainly make sense to favor imports of strategic materials—particularly oil—from this continent and this hemisphere. Our foreign policy should permit this.

But there is another aspect of national defense in the program for limiting oil imports. It is not easily understood outside the oil industry and is generally missed by critics who deplore protection of "marginal U. S. oil producers."

The point is that almost every established and partially depleted U. S. oil field is a "marginal producer" compared with many of the lush, flush foreign fields. If we want an effective domestic oil industry for future defense emergencies we must give it a measure of protection now.

Years ago this country learned that conservation requires protecting the market for "marginal" wells by limiting the output of flush new fields. This proven principle of proration and ratable take has now been extended to imports. It is a sound defense measure.

BUT HERE AGAIN it is unfortunate that our old "nondiscriminatory" foreign policy penalizes Canada. For Canadian crude production is prorated to market demand just as in this country—which is another defense reason for treating it almost like domestic crude.

Canadian wells are not permitted to produce more than the current requirements of available markets. Hence there is little danger of a flood of excess oil crowding onto our markets at distress prices to undermine the defense potential of our domestic oil industry. This is not true of most other foreign producing areas.

A sound permanent policy of regulating oil imports as a national-defense measure should admittedly favor, first, the most accessible sources, and, second, those which pose no threat of hogging the market.

1957 has been a year of contrasts.

Significant advances in technology, the completion of a substantial portion of our program to expand our productive capacity in the U. S. and Canada and the strengthening of our marketing organization are all tangible achievements which will bring us both immediate and long-term benefits. On the other hand, a generally lower activity in new projects coming in has emphasized the narrowing profit margins faced by most businesses and points up our insistence on improving designs, reducing costs and increasing efficiencies.

Abroad, the picture is bright. Our subsidiaries report current high levels of business and there is great optimism for the future. Of particular interest is the success of our newest family member, Dorr-Oliver Pty. Ltd. of Australia, which opened its doors on January 1 of this year and by mid-year had far surpassed expectations. Growth of Dorr-Oliver (India) Ltd., another of our newer associates, has also been noteworthy, with the recent addition of local manufacturing facilities justifying still greater optimism.

SUGAR — In 1957 a total of 42 RapiDorr Clarifiers and 48 Oliver-Campbell Cane Mud Filters were sold to the cane sugar industry. A significant aspect of this outstanding record has been the increasing participation of our subsidiaries and representatives abroad. They are locally manufacturing, in some instances for the first time, 31 of these machines in Argentina, Brazil, England, France, Germany, India, the Philippines and South Africa.

POLYETHYLENE — The first Merco Pressure Centrifuges went into operation early last year removing catalyst from liquid polyethylene at capacities considerably in excess of original expectations. Overseas, British, Italian and German producers ordered Pressure Centrifuges for similar application in both new commercial scale and pilot plants.

SANITATION — One of the highlights of the year was D-O activity in the waste water disposal field. Four major new developments — all ideally suited for smaller plants — were introduced. The SpiroVortex System which is a complete treatment process akin to activated sludge, the Degritting Clarifier and Clarigester and the DorrClone Classifier as applied to sewage degritting have already been commercially proven at plants in the western U. S. First installations of the CompleTreator, a package plant to serve a population of 150, are now operating with some 30 additional units scheduled to start up in 1958.

Our subsidiary in the Netherlands has marketed equipment for facilities as far distant as Norway, Iraq and India, while new or enlarged D-O equipped domestic installations sold in 1957 can be found from New York City to Los Angeles and San Antonio, Texas to Fairmont, Minnesota.

GENERAL METALLURGICAL — Applications of the DSM Screen, first introduced in 1956, continued to grow in virtually every field we serve. One of the most promising has been magnetite recovery in heavy media cyclone plants on the Mesabi Range. Also new is the swing-type agitator for the American Filter — a development particularly applicable to filtration of heavy metallurgical slurries.

Following the trend noted in previous years, widespread acceptance of the Slurry Mixer by the cement industry and the Thickener — American Filter combination by the coal industry continued again last year. In Germany, France, India and Australia flue dust clarification and recovery contributed materially to our business and in Canada a substantial volume of Dorr-Oliver-Long shaft equipment and mine cars was purchased for underground mines.

PLANT ENGINEERING—At the year's end, design of a granular fertilizer plant for India and sections of a new Cuban nickel recovery plant were partially completed, and construction of three D-O designed phosphoric acid or fertilizer plants was progressing in Venezuela, England and Montana. During the year a 200,000 ton per year triple superphosphate plant in Florida and a Norwegian phosphoric acid installation were put into operation and brought up to design capacity in near record time.

FLUOSOLIDS SYSTEMS — Also in the fertilizer industry two western producers ordered the first FluoSolids Systems to be used for calcination of phosphate rock. Designed to handle a total of 1,500 tons per day, these installations were the direct result of successful field tests using a portable fluidized bed pilot plant. During the year other FluoSolids Systems were ordered to dry limestone and blast furnace slag in the U. S., roast copper matte in Belgium, calcine clay in Scotland, decompose copperas in England, and roast pyrite for a Japanese paper mill and an Italian sulfuric acid manufacturer.

The largest FluoSolids System for fine coal drying, handling over 600 tons per hour, went into operation during the third quarter at a new eastern preparation plant, and construction is nearing completion on a second similar, but smaller, installation. In the realm of unusual applications is a unit drying a highly-corrosive chlorinated hydrate at an eastern chemical plant.

WATER TREATMENT — In the southwestern United States the DorrClone Classifier has been used with notable success for the desanding of municipal well water supplies. For small plants the PeriFilter System with a single pre-treatment unit and split filter provides economical unitized water treatment.

Major expansions of the Louisville, Kentucky and Fort Worth, Texas treatment facilities will be D-O equipped as will new municipal plants at Springfield, Ohio; Peoria, Illinois; and Delhi, India. New industrial treatment installations will serve pulp mills in South Carolina, India and Venezuela and an Indian fertilizer plant.

PETROLEUM — Another modification of the familiar DorrClone Classifier is the Clay-Jector, latest development for control of drill mud weights. Noteworthy economies are possible using this unit which mechanically rejects undesirable drilled solids while recovering valuable barites for reuse.

CHEMICAL — A substantial amount of D-O equipment of all types has been incorporated into the unique flowsheet of a new astrakanite recovery plant in the Chilean nitrate fields. In Germany and the United States, Horizontal Filters have been widely applied to dewatering and washing of fine organics as well as highly corrosive inorganics, and around the world filters of both standard and special construction were ordered for an almost endless variety of services.

COPPER AND URANIUM—Last year substantial amounts of D-O processing equipment were purchased for new and enlarged copper mills in South America, Mexico, the Belgian Congo and United States and new uranium mills in Australia, United States and Canada. A new and improved design and method of fabrication of stainless steel rake Classifier blades was developed. Although conceived initially for the uranium industry this design is broadly applicable to classifications involving corrosive solutions. Certainly no summary of 1957 accomplishments would be complete without mention of the Chemical Engineering Achievement Award presented last month to a group of companies including Dorr-Oliver for their contribution to extractive metallurgy of atomic age metals. Interestingly enough, D-O was one of the very few engineering equipment organizations selected for the award.

With several years of expansion and enormous activity behind us, the current business plateau provides a much needed opportunity to consolidate and catch our breath. The real challenge will be to increase the spread between income and outgo through more efficient operation — while accelerating the rate of our technological advances. I am confident we can, and will, do both.

J. D. Hitch, Jr.
President

November 18, 1957

DorrClone, FluoSolids, PeriFilter and RapiDorr T.M. Reg. U. S. Pat. Off.

the OIL AND GAS JOURNAL

January 13, 1958

Canada to Make Big Issue of Imports

Formal protest through diplomatic channels is planned, even though cut on West Coast would amount to 4,400 bbl. or less. What Canada fears is that restrictions now would puncture plans for expansion at home.

FORMAL PROTEST against the new West Coast import control program is expected to be filed with the State Department shortly by the Canadian Government.

Canada is so concerned over the matter that it may be the subject of discussions in Washington between Prime Minister Diefenbaker and President Eisenhower, it was indicated in informed circles.

Canadian officials will continue to press for relaxation of the import curb. But direct retaliation has been ruled out by Finance Minister Donald Fleming.

The claim that the controls are designed to bolster security makes "no sense" and disregards the principles of economic cooperation which have long been followed by the two countries, Fleming told the Canadian Commons early this month.

Fleming told The Oil and Gas Journal Canada intends to submit a formal note to the Government of the United States. Such a note, he said, "must follow the usual diplomatic channels." He declined to say what the note might contain or what would be its nature.

The 10-day delay in announcing the program after it was signed by President Eisenhower last month was due to the protest of the Canadian Government, he disclosed.

The matter was discussed in Paris during the North Atlantic Treaty Organization meeting, since the heads of both governments were there at the time, he told the Commons.

Fleming related that he talked both with Treasury Sec. Robert B. Anderson and Douglas C. Dillon, deputy undersecretary of state for economic affairs.

"At that time I was able to learn in considerable detail the reasons lying behind the U. S. system of voluntary

FINANCE MINISTER FLEMING
". . . Unfortunate, wasteful and unnecessary."

restrictions and I was able to explain the harm that I feared would follow if those restrictions were applied to Canada," he said.

Fleming pointed out that Alberta, like Texas, prorates its production. So there need be no fear of a flood of Canadian oil into District 5, he asserted.

On the other hand, the states in District 5 are the "natural and economic" market for Canada's western oil.

"In time of international emergency they would unquestionably depend to a considerable degree on Canadian supplies," Fleming said.

The price angle . . . Fear of a serious drop in prices, which would damage not only suppliers in the U. S. but those in Canada and overseas as well, was a basic factor influencing the U. S. in adopting import control, the finance minister said.

"We have not been able so far to persuade the U. S. Government to exempt Canadian oil from its program," Fleming admitted. "In the long run, we are confident that the U. S. will be a willing market for our oil since their demand for oil appears likely to outrun their reserves.

"It would be unfortunate, wasteful, and surely unnecessary to find both countries committing themselves in the short run to restrictive practices which would be uneconomic and harmful rather than helpful to effective cooperation in time of war."

Washington officials had no comment on Fleming's statement. And there is no indication the program will be modified.

The effect . . . The cut in Canadian imports under the new quotas is estimated at not more than 4,400 bbl. daily. Officials pointed out that the importing companies still can bring in Canadian oil, since the program does not state the sources on which they must draw.

The only imports to the West Coast from Canada enter the nation via the Trans-Mountain Oil Pipe Line and are used principally in Washington State refineries now operating well below capacity. Formerly some Canadian crude came to the U. S. by tanker, but a drop in tanker rates gave the edge to competing foreign crude.

The three major importers of Canadian crude into the West Coast are Shell Oil Co. (30,789 bbl. daily in November), Socony-Mobil Oil Co. (18,083 bbl.), and The Texas Co. (6,083 bbl.). Socony and Texas also get crude from other foreign nations for their West Coast operations.

The Trans-Mountain line delivered

102,000 bbl. in November, but nearly half of this was siphoned off at Vancouver before entering the U. S. Total deliveries dropped considerably during the year because of refinery strikes, turnarounds, and loss of business due to lower tanker rates. Deliveries in May, for example, were 200,000 bbl. per day.

The 720-mile line, extending from Edmonton to Washington via Vancouver, has a capacity of 250,000 bbl. daily, and expansion to 300,000 bbl. had been planned this year with additional looping. The ultimate capacity goal is 400,000 to 500,000 bbl. daily within the next 4 or 5 years.

It is this long-range program that concerns Canada. While the West Coast controls will have little immediate effect, they may puncture plans for boosting production of Alberta crude for the U. S. market.

Support . . . In San Antonio last week, J. J. O'Brien, president of the Texas Independent Producers and Royalty Owners Association, questioned the Canadian complaint.

Canada, he said, recently halted export of natural gas to the United States to conserve its own reserves. It also limits imports of many products "by quotas, permits, antidumping provisions, and other specialized means."

Compliance . . . So far, 15 of the 18 West Coast importers have formally indicated that they will go along with the program. Three of the 15, however, have requested a chance to talk about their quotas with Capt. M. V. Carson, administrator.

Carson is expected to grant quick hearings to these requests from Richfield Oil Co., Wilshire Oil Co., and U. S. Oil & Refining Co.

The three importers that have not yet indicated their positions are Superior Oil Co., The Texas Co., and Macmillan Petroleum Corp.

East Coast . . . On the other side of the nation, three companies which have not formally complied with the East Coast program are working out their import problems, Interior Sec. Fred A. Seaton disclosed.

Tidewater Oil Co.'s November imports were down almost to the recommended level, Seaton said. No further difficulties are expected.

Sun Oil Co., which declined to accept its quota formally because of antitrust fears, has reported it is prepared to cut imports back during the first half of this year.

Eastern States Petroleum Co. still is trying to work out contractual problems with its foreign supplier.

Gas Ruling Opposed

. . . by FPC's Kuykendall because of drastic effect on the industry. Legislation may "correct" the Memphis decision.

A NEW LAW to reverse the effect of the Memphis case decision will be urged by the Federal Power Commission in the annual report it will send to Congress shortly.

But such a law could operate only in the future, Chairman Jerome K. Kuykendall warns. Nothing less than Supreme Court reversal of the decision by the District of Columbia Appeals Court will save the natural-gas pipelines from serious injury.

There is ample reason for the pipeline companies to suffer from "Memphis Blues," Kuykendall told the New York Society of Security Analysts. He said:

. . . Companies face the prospect of having to refund more than $203 million collected in higher rates subject to refund.

. . . It could logically be contended that, on the basis of the decision, all increases obtained by unilateral rate filings since passage of the Natural Gas Act are void and refunds must be made except in cases which were settled by agreement of all parties.

. . . Expansions planned for 1958 may be deferred until the issue is settled.

. . . The ability of pipelines to get new financing is impaired.

Essence of the court's ruling is that all customers of natural-gas pipelines must agree to a rate increase.

Kuykendall said FPC will support legislation to "correct" the Memphis decision.

"Congress has many times demonstrated that it can act speedily when the need to do so has been shown," he said. "I for one do not know of any interests or groups which would oppose such legislation if they ascertain and understand the facts."

Current effect . . . The Appeals Court decision will have no effect on FPC operations until the court's mandate is received. The mandate will be issued only if the Supreme Court refuses review. Kuykendall is confident the Supreme Court will take jurisdiction in the government's appeal, filed at the year end by the Justice Department.

The FPC's policy of waiting on mandates was adopted while the original Phillips case was pending. The lower court decision on Phillips was issued in May 1953, and the Supreme Court did not finally decide the case until June 1954.

JEROME K. KUYKENDALL
. . . he sings the "Memphis Blues."

During that period the FPC did not try to force Phillips and other independent producers to comply. To have done so would have created a great volume of litigation because producers fought FPC edicts.

The same situation prevails again, Kuykendall said. So long as the Memphis decision is not final, any appealable order based on the principles involved, whether in accord with or contrary to it, will be appealed.

The FPC hopes that a mass of litigation can be avoided. But Kuykendall indicated that pending cases involving rate increases for pipelines will not be frozen for that reason.

Since the decision, the FPC has allowed a $16.5 million rate increase to El Paso Natural Gas Co. The commission's only change in policy stemming from the Memphis case was an order that the company post bond, or put the additional revenue in escrow, to insure full refund if necessary.

Principle at stake . . . The Memphis decision has raised a vital issue, Kuykendall pointed out.

The issue is constitutional—whether a regulated company deserves protection from confiscation of property.

The ruling could have the effect of forcing a company to refund so much money that it becomes bankrupt and thus no longer is able to render necessary service to the public.

"I doubt very much if the court comprehended the magnitude of the result of what it was doing and realized that, in addition to dealing with the price of gas to the city of Memphis, it was setting a precedent involving, as of now, more than $200 million in refunds," Kuykendall said.

He added, however, "I find it difficult to believe that the Memphis decision will ultimately cause the bankruptcy of an important part of the natural-gas pipeline industry."

Important changes will have to be made in FPC practices if the Memphis decision holds, Kuykendall predicted. Section 5 of the Natural Gas Act always has been viewed as providing a method for lowering rates, not to pass on pleas for raising them.

Section 5, as the court decision indicated, provides that companies wanting to change rates must ask for a review of the rates on grounds they are unjust and unreasonable. Such reviews take up to 2 years, during which time there could be no increase, not even on a refund basis.

Kuykendall said that if the decision stands the commission will take action to speed up handling of cases.

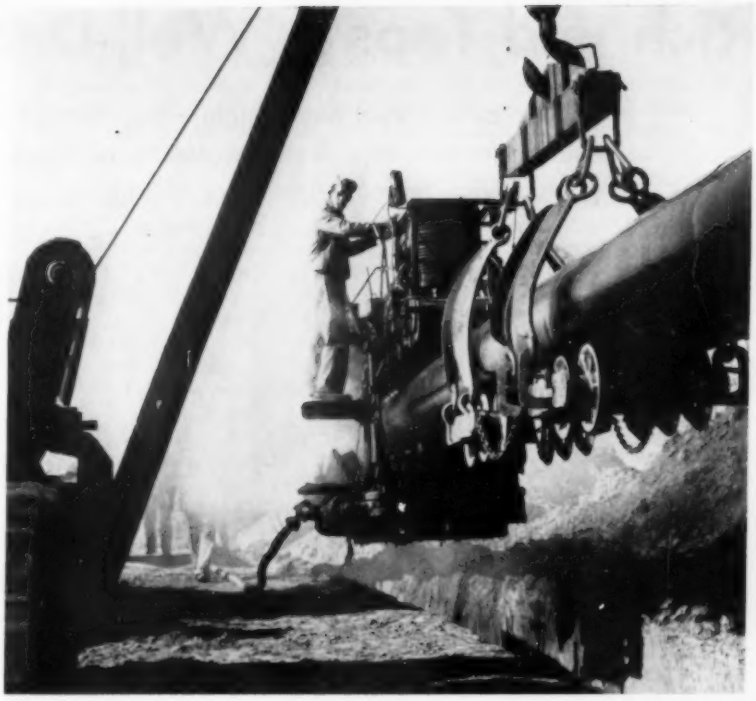
The brighter side . . . Some good may come out of the present situation, Kuykendall believes.

In the past, he said, some people have opposed a rate increase as inherently evil, without regard to whether it was necessary in order for service to be rendered. They have opposed any legislation supported by any segment of the industry, apparently on the theory that if the industry wants it, it's bad for consumers.

"The Memphis decision is forcing such persons to face reality and to admit that, after all, a pipeline company must remain solvent if it is to render service," Kuykendall said. "There seems to be good reason to hope that the present difficult situation will ultimately lead to creation of a better environment in which to dispose of regulatory problems."

The FPC chairman spoke encouragingly of the gas industry's future despite the current reversal.

"I do not believe that this industry necessarily must become bankrupt if this decision stands," he said. "There is still a market and a seemingly insatiable demand for the product. Where there is a demand and a supply, sales and purchases will be made. Thus the essential ingredients for a healthy industry remain."



New Line To Move Texas Gas

NEWLY COMMITTED GAS reserves in three Southwest Texas counties soon will start flowing to market through this 24-in. line being laid for Transcontinental Gas Pipe Line Corp.

The 151-mile segment of 24-in. pipe, scheduled to be completed by spring, will provide a shortcut to the Transco main line for gas produced in Frio, LaSalle, and McMullen counties.

Late in December Transco started moving gas in quantity from Frio County reserves dedicated to the pipeline company by Frio-Tex Oil & Gas Co. Transco is scheduled to start taking gas from other reserves in McMullen County by the end of January.

Gas from the Southwest Texas area is now moving from the three-county gathering system built last fall through Transco's Ike West lateral into the main line near Sinton, Tex. The new line now under construction near Goliad, Tex., will connect the three-county gathering system with the Transco compressor station near El Campo, Tex.

The Transco system extends from South Texas to the metropolitan area of New York, New Jersey, and Philadelphia.

Sam Rayburn says:

Harris Bill To Pass This Year

CONGRESS returned to Washington last week with the stage set for another try at passing the Harris gas bill.

As the new session opened, House Speaker Sam Rayburn predicted that the bill will be brought up—and passed.

But before action is taken, he said, another poll of the House will be made.

"We will bring the gas bill up, I am sure—probably in February," Rayburn said.

"But first we want to make a poll to see where it stands now. We had only a partial poll last year."

Rayburn denied that the measure was held up last session because of a lack of votes to pass it. He said the bill had the necessary support, but he didn't want to bring it up because of lack of time.

Congressional leaders discussing the prospects for the session saw no chance of general tax reduction. But they said there might be some small tax changes in the bill which the House ways and means committee will write after hearings which started last week.

Richfield Taps A Well-Data Gold Mine

● New card system has complete information on every California well. It's a simple matter now for operator to print quickly any set of facts geologists or production men need to solve a problem.

BEFORE the new card system was adopted, Irv Schwade, Richfield's West Coast regional geologist, covered his desk with logs and record sheets when determining formation tops for plotting contours.

AFTER system was installed, Schwade had just the information needed for plotting contours. It's printed on a readable 15-in. sheet. It gives speed and accuracy to Schwade's work.

GEOLOGIST SCHWADE, pictured above, is only one of many Richfield Oil Corp. operating employes who stand to benefit from a comprehensive well-history control system just installed at the company's Los Angeles headquarters.

Under the system, virtually every obtainable piece of information on every hole drilled in California is placed on punch cards. The wells include completed ones, dry holes, deepening jobs, recompletions, and redrilled holes.

Magnitude of the system is impressive. For instance, it:

. . . Provides a variety of ways for reporting information.

But just as important, it uses the industry's own terminology to do it. Code books and machine translations are not necessary.

. . . Provides a wide range of information.

Some cards on early wells include just the well name, simple location description, and what happened. More recent wells get an engineering analysis requiring as many as 16 cards per well in some cases. The average is five

How Richfield's Well History System Works

1. PUNCHING well histories is job of Mrs. Pat Ryan. Automatic features of machines enable her to enter fundamental data on current wells and dry holes at rate of 6 to 10 wells hourly.

2. FILING the cards is the job of Don Raney, who also selects punch cards to process when information is requested. Cabinets contain 325,000 cards filed by the exact location of the wells.

cards to cover information on each well.

1. What it will do

Richfield expects much from the new technique.

Schwade sums up the advantages this way: "It enables us to bring to bear on any given situation all the pertinent facts quickly."

He explained this is true no matter how large an area the facts cover, how extensive the information wanted, or at what depth. In fact, Schwade declared, "the highly selective system helps our professional talent arrive at conclusions based on fact in less time, with less labor and less cost."

Specifically here's what Richfield management expects the new card system to do:

... **Speed up distribution** of information to individuals concerned whether in the home office or in the field.

... **Make substantial contributions** to subsurface studies. It is now quicker to set up multiple, vertical, two-dimensional cross-sections or two-dimensional contours.

... **Promote the accuracy** of information by standardizing the data and taking advantage of machine recording, filing, printing, and automatic checking.

... **Make compiling** of routine monthly reports and statistical information easier and less expensive.

B. H. Brandon, chief of Richfield's control center, said the new approach to information accumulated by company scouts and industry exchanges gives increased value to their efforts.

He added, "Data which have never before been handled for lack of talent-time are now accessible-in-time and usable for the life of the industry."

Who will use it . . . Operating departments will reap bulk of the benefits.

Geologists will use the information for quick details on such things as formation tops, well depths, and core results on particular areas. Special arrangement of the information can be made to fill requests for data to make cross-sections or contours or be made to show comparative facts, such as perforated intervals.

Production and engineering departments now can obtain fast information on pay zones, pressures, production potentials, gravities, etc.

Geophysicists can get formation tops in specified areas for use as controls.

In addition service departments, such as scouting, drafting, economics, and research, can readily make use of the information.

2. The system

The Richfield installation is based on the Well History Control System designed and copyrighted by Petroleum Information, Denver.

The Denver organization kept a staff of researchers and punch-card operators busy more than a year gathering, unscrambling, and incorporating complex California well information into the system.

Petroleum Information officials declared the system is the result of 2 years of experiment and research. It now is ready for application to the oil industry on a national basis.

Invitations have been extended to selected Rocky Mountain and Mid-Continent oil companies to attend private demonstrations in Denver the last week in January. Representatives of the companies will be shown then how the system may be applied to their own well-data problems.

First part of the system includes all fundamental well data. This is information normally exchanged by the industry. It's generally available on all but tight holes.

The fundamental data is divided into three categories:

... **Identification.** This includes exact location, classification as to wildcat or development, and whether well is dry, a pumper, flowing, gas, suspended, or injection.

... **Substantial.** This includes information obtained by measuring devices not requiring analysis, such as depths, plugbacks, perforated intervals, sizes and setting points of casing, initial production, drill-stem tests, pressures, gravity, choke, cut, and spud and completion data.

... **Interpretive.** This involves information from analysis of logs and other surveys. It includes formation tops, producing-formation names, subsurface composition, etc.

The second part of the system in-

3. REQUESTS for data from the cards come from Mason Hill, manager of exploration, or some other department head. Requests must state what data are wanted and in what order.

4. PRINTING the report is a simple matter of running the cards through a machine. Here Ralph Moeller shows a report being printed on a 15-in. sheet. Reports also can be furnished on a series of cards.

LOOKING AHEAD to expanded uses of Richfield's well-history information is the job of this informal research committee. Working on the task are Floyd Chambers, reservoir engineer; B. H. Brandon, chief of the control center; Rufus Clark, evaluation engineer; and Harry Jameson, staff geologist, all seated left to right; and Ed Goodin of Petroleum Information, standing.

cludes all other substantial or interpretive facts Richfield has on its own wells and those of others which are not included in the fundamental facts.

An unusual tracking device has been built into the system. It will enable Richfield to associate virtually all other facts with the fundamental data assembled on a hole.

How it works . . . The Richfield installation is administered through two offices:

. . . The control center is charged with receiving and entering information received from all sources. It also has the job of approving requests for multidata reports, keeping a readable card file on all the wells, and for storing or disposing of used reports.

. . . The processing center keeps the punch-card file in six regulation cabinets and processes and prints the approved report requests.

In operation, the system uses standard punch-card machinery. This includes a printing card punch, a collator, sorter, and an IBM Type 407 accounting machine.

Only one full-time employe is needed to edit and enter data in the system. In Richfield's case, a young woman with 3 years' experience in the scouting department was assigned to the job. She went to a short training course at the IBM school in Los Angeles before undertaking the work.

The individual cards have spaces for 80 vertical columns, 12 rows deep. They are stored by township, range, and section in the processing center. A complete set of readable cards on each well also is maintained.

A typical example of how the system works goes like this:

A member of a division wants some information to update an area which he has been assigned for problem solution. He requests a complete report on the area through his division head.

The request is then forwarded to the control center for final checking and approval. It is sent next to the processing center where the pertinent punch cards are electronically processed. The information is printed either on individual readable cards for each well in question or on a single printed form. It is then forwarded to the requester.

When he is finished with the report, he returns it to the control center where it is either filed or destroyed.

3. Its value

How Richfield views all this available information is explained by Mason Hill, manager of exploration.

"We still expect our staff members to challenge every fact, especially those which have been interpreted.

"Each bit of data, whether substantial or interpretive, has a relative reference value in oil finding and recovery. We now have the tool necessary to get the best results from the vast amounts of information available."

Industry briefs

Falcon Seaboard Drilling Co. is operating its new submersible drilling barge in Vermilion Bay off the coast of Louisiana. Named after the company's president, the "Theo N. Law" is equipped to go to 22,000 ft. First assignment is for Gulf Oil Corp. in the Audubon Game Reserve. The giant vessel is 220 ft. long and 52 ft. wide, and has an all-steel helicopter landing deck on top of the crew's quarters. It was built by Levingston Shipbuilding Co. at Orange, Tex.

Two more LACT systems have been approved for Texas fields by the Texas Railroad Commission. Kewanee Oil Co. will install such a system to handle oil from the Cree-Sykes field (Upper Gardner) of Runnels County. And Phillips Petroleum Co. will use LACT on its University Andrews lease in Embar (Ellenburger) field of Andrews County. Both permits are conditioned to a commission review of LACT unit operations in 6 months.

A tripod drilling platform designed to operate in more than 100 ft. of water will be commissioned at New Orleans January 14 by Dixilyn Drilling Corp. The unit, known as the "Julie Ann," was built by R. G. LeTourneau, Inc. It will be the third offshore rig operated by Dixilyn.

Alaska has become the twenty-eighth member of the Interstate Oil Compact Commission, with the signing of an agreement by Gov. Michael A. Stepovich. The territory, which had been an associate member, was eligible for full membership after Richfield Oil Corp. discovered oil on the Kenai Peninsula last summer. Authority to join the compact was granted by the territory's 1953 legislature, pending discovery of oil.

Phillips Petroleum Co. ran into trouble last week at one of its deep tests in Pecos County, West Texas, when drill pipe parted at 21,397 ft. in the 1-EE University.

The company was hoping to recover fish so that it can go down to the projected depth of 23,000 ft. in search of production in the Ellenburger. At that depth the well would be the deepest hole in the world (see related story, p. 62). The wildcat is just 7 miles northwest of the world's second deepest hole, the Pan American Petroleum Corp. 1-CS University which was abandoned last month at 21,687 ft. after drill-pipe parted.

New Price Cuts Are Kept Small, Local

- Humble leads the way in keeping lower Gulf Coast reduction at 10 cents. The question now is this: Can Suntide stick with its slash of a quarter?

- The Tri-State area has settled to lower prices, but there's a nickel difference among the buyers. The cut has affected Corning grade crude in Ohio.

THERE were more crude price cuts in the industry last week, but oil men breathed easier. The cuts were small, and they were localized.

No new signs appeared that the industry is in for a general price reduction. Here is the picture:

. . . A downward adjustment has occurred in the lower Gulf Coast.

. . . Lower prices have taken hold in the Illinois basin and are spreading east to the Corning area in Ohio.

. . . While the market is soft elsewhere, the majors are resisting any move to reduce prices generally.

But the period of uneasiness is not over, and the industry is still watching the price structure closely.

The lower gulf . . . Humble Oil & Refining Co. made the biggest news of the week—not because of what it did but because of what it didn't do.

For the most part, Humble limited its cut to 10 cents and kept it within Southwest Texas. The fact that the cut was only a dime and was confined to the single area indicated Humble's determination to localize the adjustment and keep it small.

The reduction affected several types of crude, including Sweden and Refugio light. Humble also cut by 20 cents the price in three Atascosa-Frio County fields, but this was the result of downgrading of the crude affected. The three fields are Charlotte West, Crown East (Navarro), and Galba (Navarro).

The new Humble postings affect some 50 fields in an area where three other purchasers had recently reduced prices.

When Suntide Refining Co. announced a 25-cent reduction in the same area 2 weeks ago, the industry feared that Humble, largest operator in Southwest Texas, might follow suit and apply the cut also to the upper Gulf Coast. This could have affected Louisiana prices.

The question now is whether Suntide's deep cut will stick. Other major buyers in the area dropped crude prices last week—but only a dime. Most companies are now at this level, and only Suntide has gone below it.

Southern Minerals Corp. started the new pricing trend in Southwest Texas in December by reducing its postings by 10 cents per barrel. Sinclair Crude Oil Co. followed with a similar cut, and then Suntide startled many producers by slashing 25 cents off posted prices.

Last week several big purchasers fell in line with the 10-cent figure. These included Magnolia Petroleum Co., Continental Oil Co., Sun Oil Co., and Republic Oil Refining Co.

Humble's view . . . Humble President Morgan J. Davis said local market conditions dictated the price cut of his company and that large volumes of crude had been moving below Humble's posted prices in the area.

He said also that prices of certain crudes in the affected area had been out of line with those of competitive crude, and the cut was necessary to maintain adequate markets for production from fields affected.

Humble did not disclose the volume of crude involved in its price cut, but more than half the production affected is from the company's own wells.

Prices in the Corpus Christi area were boosted in January a year ago as much as 45 cents per barrel, while the increase over the industry in general averaged only 25 cents.

This means that the new prices are still well above the rate in effect before last year's increase. Some types of Sweden crude, for example, are now selling 15 cents below the price posted last January but 15 to 25 cents higher than the price before that date.

The postings . . . Humble posted new, reduced prices for five types of crude:

Sweden crude formerly selling at $3.45 per barrel was cut to $3.35. The price in each case is for crude of 40° gravity and higher. Similar cuts of 10 cents a barrel were made for lower-gravity crudes in this classification, with the price ranging down to $2.93, as compared with $3.03 in the past.

This price range is now in effect for Sweden crude purchased in Borregos, Cayo del Oso, Enos Cooper (7,800 ft.), Flour Bluff, Flour Bluff East, Jay Simmons, Kelsey Deep, Kelsey South, La Rosa, Mills Bennett, Nueces Bay West (8,400 ft.), Palo Blanco, Seeligson, Sejita, Stratton, and Tijerina-Canales-Blucher fields.

High-gravity Sweden crude formerly selling for $3.50 a barrel down to $2.98 for crude below 20° was cut by 10 cents. In this classification is Sweden crude from Armstrong, Colorado, Cox & Hamon, Kelsey, Long Mott East, Prado (Loma Novia), and San Pablo fields.

Refugio light crude formerly selling for $3.13 to $3.55 now brings $3.03 to $3.45. This production is from Greta Deep, Heyser, Lake Pasture, Mary Ellen O'Connor, McFaddin East, Melon Creek, Refugio Fox, Sheriff, Tom O'Connor, and Woodsboro fields.

The Tri-State . . . In the Illinois basin of Illinois, Indiana, and Kentucky, virtually every buyer of significance had cut his prices last week. However, there were two price levels—$3 and $3.05. Originally it was 3.15 per barrel.

Pure Oil Co. and Magnolia followed Carter Oil Co. in going to the $3.05 figure. Others at that level are The Texas Co., Sun Oil Co., and Ohio Oil Co.

But most oil from the basin is selling for $3. The biggest buyer, Sohio Petroleum Co., led off with a 15-cent cut. Ashland Oil & Refining Co., second largest, followed suit.

Corning grade . . . Because it must stay competitive with Tri-State crude, South Penn Oil Co. whacked 13 cents off its Corning grade. This dropped the price from $2.90 to $2.77.

Ashland quickly fell in line with an identical posting.

Ashland explained: "Current realizations for products refined from a barrel of crude oil are lower than they were prior to the general crude oil price advances last January of 25 cents per barrel or more. Lower prices for products prevailing at this time reflect competitive conditions which result from excessive supplies of crude oil and products."

New West Texas Money Backs Oil Line

FOR 14 YEARS oil producers and promoters have fought a losing battle to build a crude pipeline from West Texas to California. Now an Amarillo, Tex., oil man and banker, rankled by his own shut-in production, is injecting new life into what heretofore has been a futile effort to put over the project.

Jay Taylor, independent producer and a director of the First National Bank of Amarillo, has taken over as president of West Coast Pipeline Co. from John B. Mills, Texas and Arizona oil man and capitalist. Taylor proposes to build the $130-million line with private capital and says half the market needed to justify the 1,030-mile, 30-in. line has been committed.

Two recent developments — one good, one bad—will vitally affect the future of the pipeline plan. The Government has just extended its import control program to the West Coast and thus created a greater potential market for U.S. crude. But the new Four Corners pipeline to California is just now going into operation and could grab new outlets opening up.

Taylor leads a group from oil and banking circles which is buying out present stockholders in the West Coast pipeline promotional venture. It has purchased most of the outstanding stock and has options on the remainder until April 1. Mills and L. M. Glasco, Dallas, the first president of the company organized in the war year of 1944, will continue as minority stockholders. Burt E. Hull has been holding the position of vice chairman of the board.

The ownership switch involves almost a million dollars. The pipeline backers have spent some $300,000 in economic and engineering studies and other activities pushing the project with California refiners and the Government.

Taylor's background . . . Tay'or is a former vice president of Halliburton Oil Well Cementing Co. and former chairman of the Federal Reserve Bank of Texas. He became interested in the pipeline because of his own situation as a producer. His plight is typical of many producers who are victims of the general soft crude market and 12-day producing schedule in Texas.

"I was desperate for a market for my own production," he says. "I looked around, and this pipeline appeared to be the logical answer for all of us. I believe in it enough to spend some of my own time and money to try to put it over."

Taylor is a realist. He has no illusions about easy success for the project which has been killed many times but refuses to die. He concedes there is a chance that he, too, will fail as others before him have failed. But he believes that enough is at stake for the whole Southwest oil industry, for him personally, and for national security to warrant renewed efforts to build the line.

Market prospects . . . Taylor reports some progress in the phase of the project which up to now has been the fatal stumbling block—a market.

He says buyers in California have agreed to take about 50,000 bbl. daily. This would be about half the throughput required on the Midland-to-Los-Angeles line. But the last 50,000 bbl. is not in sight at this time.

If a 100,000-bbl. daily throughput is guaranteed, Taylor believes private financing will be easy. The line would pay out at this low volume. But once it is built, volume is expected to grow to 300,000 bbl. daily, which is less than imports scheduled for the first half of 1958 before controls were extended to the West Coast. Throughput of up to 450,000 bbl. daily is anticipated in design of the pipeline for 30-in. instead of 24 or 26-in. as was planned in earlier stages.

Previous backers have sought government aid in loans or throughput guarantees. The line will require neither, Taylor says, if California refiners can be persuaded to cut imports enough to make room for Permian basin crude. He hopes for contracts with a few major Ca'ifornia refiners for 10,000 bbl. each daily or so, a volume which is but a fraction of their total runs to stills.

Taylor is counting on the Government to persuade the refiners to come through with guarantees they will buy the crude as a contribution to national security and thus make it possible to connect Texas' excess producing capacity to crude-deficit California. The new import restrictions are considered favorable to West Coast Pipeline.

Why the delay . . . There are two reasons why West Coast Pipeline has never been built.

First, the Government has refused

Fate of Unconnected West Texas Wells Rests

THE TEXAS Railroad Commission last week indicated it will take "some time" to decide what, if anything, to do about Texas' more than 8,000 unconnected oil wells.

Final evidence by complaining producers and defendant common-carrier pipelines went into the record January 6. It closed out a long dispute which has now been before the commission for a full year.

Lawyers for both the carriers and the five independent-producer associations summed up their cases in the 2-hour oral-argument session. Arguments pursued the same lines adopted by the contestants on earlier occasions.

Elton Hyder, Jr., Fort Worth attorney representing the producer associations, renewed charges that common carriers are refusing to connect wells. They also are failing to enlarge capacity of trunk and gathering systems in violation of Texas conservation statutes, he said.

He pointed out that 6,066 wells now without pipeline connections are in pools where other wel's are tied to pipelines. As such, he said, these wells constitute 6,066 violations of the state common-purchaser act.

State law, Hyder, argued, spells out that common-carrier lines are public utilities. This compels the lines to grant service to all wells—not just those where connections yield a high profit.

By failing to enlarge line capacity, he said, the carriers have set an artificial ceiling on West Texas production of 18 days—and thus have taken upon themselves the commission's allowable-setting function in that area.

Charges denied . . . Attorneys for the carriers contended that the complaining producers want market not pipeline transport.

In no case, they contended, has a common carrier refused to ship a producer's crude if the latter had a buyer. And common-carrier service in Texas isn't inadequate, line attorneys

To California

to guarantee its success as a defense measure. As an "emergency" line to fill the gap if normal supply should be interrupted, the line cannot stand on its on feet financially.

California refiners in recent years have not conceded the need for a West Texas line even for national security. Their position is that the 8, 12, and 16-in. Southern Pacific Pipe Lines, Inc., products system could be converted to crude from El Paso to Los Angeles.

It could be looped with large-diameter pipe within 90 days, they contend, should the need arise. Now that the Four Corners Pipe Line from Aneth, Utah, has made an additional 170,000 bbl. daily available, they argue that California is in no danger of a crude shortage, come what may.

The second reason West Coast Pipeline has failed is that it has a fundamental drawback for a private line on its own merits. It is backed by the "wrong" people—that is, by crude sellers instead of crude buyers. It is conceived as an outlet for producers rather than a line to provide a supply for a refinery, which is the traditional conception of a crude line.

If the flow of foreign crude should be curtailed sharply or shut off, the situation would change. The market which does not exist now could materialize suddenly. Then a Midland-Los Angeles line could be financed privately without difficulty. It would become a means of supplying the refineries. The refiners—as well as the producers—would have an incentive to build the line to assure their supply and protect their plant investment.

With Commission

said. John W. Stayton, Atlantic Refining Co., declared that the carriers are connected to 95 per cent of the wells and 97 per cent of the crude production in the state. "No public utility," he said, "is rendering that high a degree of service."

Further, these men argued, if there are inequities they can't be corrected by a general order—only by specific hearings on specific instances.

The commission, they said, does not have the power to issue any of the three alternative general orders sought.

Jack Vickrey, attorney for Magnolia Pipe Line Co., said that all suggested general orders not only were impractical but also illegal.

watching WASHINGTON

. . . with Bertram F. Linz

• Will depletion be an issue?

CONGRESS usually opens its sessions at a slow pace. But this year it got off to a flying start. No less than seven investigations were started in its first week.

One of these probes holds direct interest for the oil industry. Treasury officials go before the House ways and means committee this week to give their views on tax matters, including depletion.

If Sec. Robert B. Anderson comes out in favor of the present 27½ per cent rate, as he is generally expected to do, reduction of oil and gas depletion may lose much of its lustre as an issue.

There will be a fight only if some official or congressman makes an attack on the rate. Rep. Wilbur Mills, new chairman of the committee, is anxious to avoid any hass'e that might stretch the hearings out. He has indicated this by allowing only 5 hours for discussion of depletion by all industries which get the deduction.

Oil's case will be strengthened by the efforts of coal, and possibly shale, interests to get an increased allowance. Neither has to take as much risk in the search for new deposits as does the oil industry.

• IPAA looks for an answer

THERE SEEMS to be just about as much conflict in the Defense Department over oil as over missiles.

Getting any concert of opinion from its officials on either is a tough job. At least Russell B. Brown, general counsel of the Independent Petroleum Association of America, is having trouble finding out why the Defense Department is bypassing the Buy American Act in buying oil abroad as an "emergency" when no emergency exists.

Brown asked the department to explain why it is buying products from Caribbean refiners at a time when the Government is trying to curb crude imports. He got a couple of rep'ies which don't jibe.

According to Asst. Sec. Perkins McGuire, the main purpose in buying oil abroad is that a healthy oil industry in friendly foreign countries must be supported in peacetime so it will be available in war.

But 3 weeks later Maj. Gen. L. E. Cotulla of the petroleum logistics division denied that the law is being used to give preference to foreign industry. Both foreign and domestic industry compete on an equal basis, he said.

Brown now is trying to get a statement of policy from the top man, Defense Sec. Neil McE roy. Some day, maybe, he will.

• Small refiners get a break

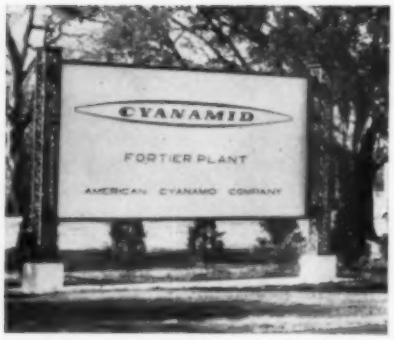
MORE REFINERS will be able to take advantage of a new classification announced last week by the Small Business Administration.

A new definition will classify a refinery as small business if it has fewer than 500 employes and a productive capacity of less than 20,000 bbl. daily, including affiliated firms. The change becomes effective January 20 unless protested.

About 130 refineries will be eligible to bid on government oil contracts for small businesses, according to SBA Administrator Wendell B. Barnes.

Their first opportunity to take advantage of the new classification will come next week when the Military Petroleum Supply Agency opens bids on $25 million worth of products.

This $25 million has been set aside for exclusive bidding by small firms and is part of a $185 million semiannual procurement. But refiners must also bid on the requirements open to large companies to be eligible to bid on the part restricted to small firms.



SIGNS of Louisiana's big growth are along every highway.

Petrochem Row Rising on Mississippi

LOUISIANA is gaily cashing in on one tendency in the petrochemical industry: One plant just seems to breed another. Once this chain reaction is started a boom may be in the making.

The payoff in Louisiana's case is nearly $300 million earmarked for building petrochemical and allied facilities in the state in the past 2 years. Scene of this activity is concentrated along a strip of the Mississippi River between Baton Rouge and New Orleans.

The easy-going plantation region is beginning to bustle with industrial activity. The dynamic growth shows no signs of easing off.

Old standby processors, such as Esso and Ethyl, are expanding their plants. Newcomers, such as Dow and Wyandotte, are putting up shiny new chemical plants. Others, such as Du Pont, have bought sites and plan to build.

The lure of this Louisiana country to chemical manufacturers is easy to understand. These processors can count on:

. . . Cheap water. The Mississippi has plenty both for processing needs and for transportation up-river to inland markets or down-river to the Gulf of Mexico.

. . . Firm gas supply. Increased developments in South Louisiana fields have opened vast resources of gas both for fuel and for raw materials. In addition refinery expansions in the region have made available light hydrocarbon streams ideal for petrochemical synthesis.

. . . Liberal tax exemptions. Under Louisiana's policy, new plant facilities may enjoy a 10-year moratorium from the tax assessor.

A recent trend . . . The Louisiana boom only really got started in 1954.

The advantages of the Baton Rouge-New Orleans region have existed for some time. But this area took a back seat to the Gulf Coast region around Houston in postwar construction. Now Louisiana shows definite signs of challenging the Gulf Coast dominance.

The big kick started 3 years ago when three firms put big plants on stream. Foster Grant Co. completed a $4-million styrene mononer plant at Baton Rouge. American Cyanamid Co. finished a $50-million petrochemical complex near Luling producing ammonia, acrylonitrile, and ammonium sulfate. Lion Oil Co., now a division of Monsanto Chemical Co., got a $31-million ammonia and ammonium nitrate plant under way near Luling.

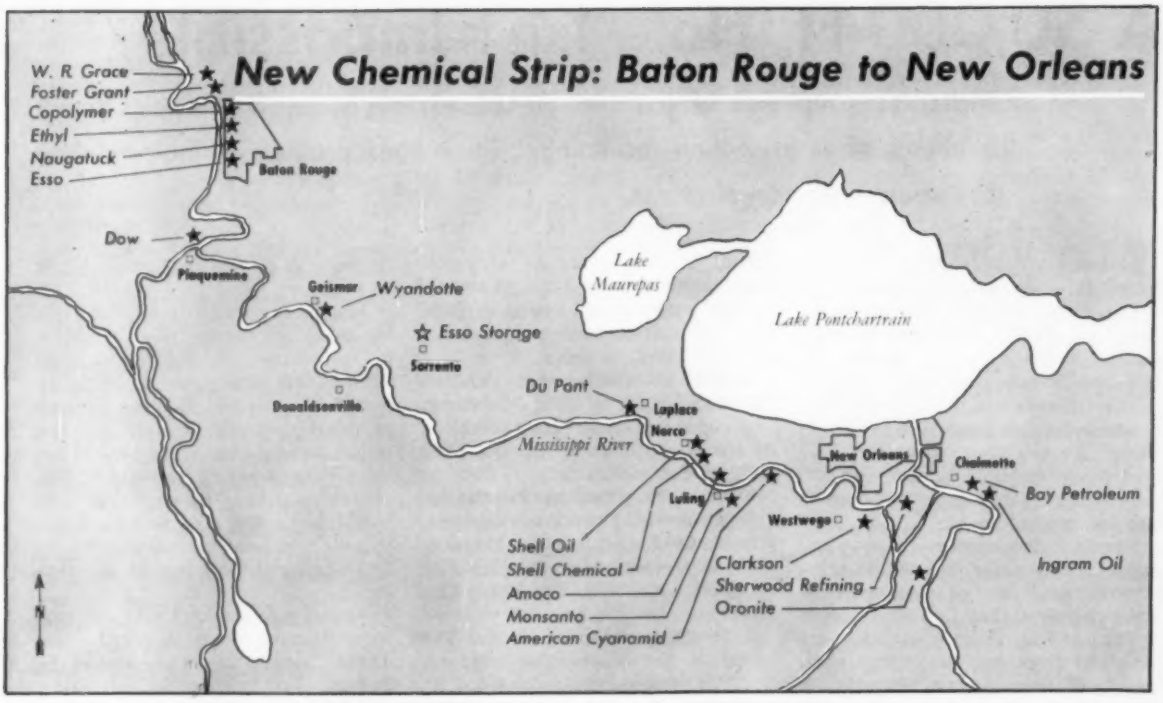
Shell Oil Co. about this time decided to expand its Norco refinery with a new catalytic cracking unit and increased crude throughput. This move made tail gases available and thereby petrochemicals became attractive. So in late 1955, Shell Chemical Corp. put on stream a plant near the refinery to make allyl chloride and chlorohydrin.

Fast growth . . . One phenomenon of these plants is this: Hardly had they been completed before expansion work was under way.

Cyanamid has earmarked $39 million to double output of acrylonitrile, add a monomethyl-styrene plant and make acrylonitrile derivatives.

Foster Grant plans a $3¼-million expansion in its styrene facilities. Shell Chemical has begun preliminary operations on its $15-million hydrogen-peroxide and secondary butyl alcohol units at Norco, and plans $12½ million for acrolein production. Monsanto also has brought a new $2.4-million adipic acid plant on stream.

While this activity was going on downstream, Esso Standard Oil Co. got deeper into petrochemicals through its refinery near Baton Rouge. Esso has pioneered producing its own chemicals. Sales of chemical synthesis



SPURT in new plants marks regional economic revolution.

May Rival Houston Area

streams, however, was largely limited to feed stocks for Copolymer Rubber & Chemical Corp. for making synthetic rubber.

Esso expanded, however, with a new $12-million ethylene-recovery unit and storage facilities at Sorrento. It thus furnishes ethylene for Foster Grant's nearby styrene plant. And with ethylene available, W. R. Grace & Co. came into the picture with an $18-million polyethylene plant at Baton Rouge.

Wyandotte Chemical Corp., meanwhile is constructing a $12-million ethylene-oxide plant which also will turn out ethylene glycol and a $20-million chlorine-caustic plant. Both are at Geismar down river from Baton Rouge but near Esso's Sorrento storage facilities.

Dow Chemical Co. is putting $65 million into plant near Paquemine. Dow plans to make ethylene, propylene, glycols, vinyl chloride, and other chlorinated hydrocarbons from LPG and brine.

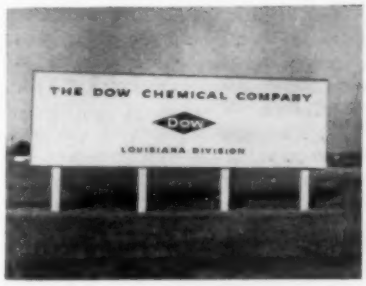
Du Pont has bought a 600-acre tract near Laplace and is expected to build a linear polyethylene resin facility. The location makes it convenient both to Esso's Sorrento storage dome and to Shell's Norco installations.

Rounding out the picture are smaller projects. These include Copolymer's $15½-million butadiene and rubber expansion; Naugatuck Chemical Co.'s $11½-million expansion in resinous molding powders at the Baton Rouge plant; American Oil Co.'s $1-million polybutene unit at Destrehan; Oronite Chemical Co.'s $1.2-million plant for lube-oil additives at New Orleans.

Tax advantages . . . Louisiana has added a tax plan to its natural advantages in luring this new petrochemical construction.

Each new installation is granted a 5-year moratorium on state property taxes. A 5-year extension also may be granted. This exemption does not apply to land, raw materials in the course of manufacture, nor on stocks of finished products. At the end of the 10-year period the physical plant is listed on assessment rolls at actual cash value.

Louisiana authorities feel this unabashed attempt to encourage industry to take advantage of the state's natural resources is paying dividends. They feel sure the surge of activity will continue because one petrochemical plant just seems to call for another.



A 50,000-Ft. Hole Isn't Impossible

That's the conclusion of a panel of U.S. experts annoyed at reports Russia is ahead of us in drilling technology. The biggest problem, in their opinion: Extremely high temperatures.

AMERICAN DRILLERS can reach 50,000 ft. if the necessity arises.

That's the tart reply of a group of American drilling experts to Russian claims of having a rig capable of drilling a 10-mile deep hole.

The oil men admit that high temperatures expected at such a depth would give American drillers fits. The heat would certainly be too high for present muds, logging tools, cements, and bits used today.

Recent developments, however, make it possible to extend the temperature resistance of most material and equipment, they feel.

The drilling authorities, however, refrained from one prediction: How soon will there be an incentive to punch so deep a hole in the ground?

How it started . . . The concern over drilling to 50,000 ft. stemmed from a statement by a Russian geophysicist at a recent meeting held in Canada as part of International Geophysical Year observances.

An American scientist at the session reportedly remarked it would be nice if drillers could go 10 miles down.

The Russian said flatly that his countrymen already have a rig capable of doing just that. He added the Russians simply are looking for a good place to locate the well.

The incident was reported in Life magazine which handled the story in such manner that some drilling people took offense. The article made it appear, they said, that the Russians have outdistanced Americans as far in drilling as they have in rockets.

"Not so," the drilling engineers remarked. "American drilling is still way out in front."

But this spotlighted the question: If the Russians are now capable of drilling to 50,000 ft., are we?

Who talked . . . Interest in the question prompted the petroleum group of the South Texas section of American Society of Mechanical Engineers to hold a special panel to discuss the issue.

That panel, held in Houston last week, came up with a few surprises. Members are all well-known eng neers in the drilling and related industries. They include:

Paul Weaver, professor of petroleum engineering at Texas A. & M. College and recently retired as technical assistant to the vice president, Gulf Oil Corp., Houston.

Jack H. Abernathy, vice president, Big Chief Drilling Co., Oklahoma City, and immediate past president, American Association of Oil Well Drilling Contractors.

Thomas W. (Tucker) Pennington, senior supervising petroleum engineer, Humble Oil & Refining Co., Houston.

W. D. Owsley, senior vice president, Halliburton Oil Well Cementing Co., Duncan.

Lyle Payne, assistant to the vice president for engineering, Hughes Tool Co., Houston.

Sheldon Reynolds, engineer, National Tube Co., Houston.

W. B. Steward, assistant to the vice president for engineering, Schlumberger Well Surveying Corp., Houston.

Orien Van Dyke, vice president Magnet Cove Barium Corp., Houston.

The big problem . . . All panel members agreed the big problem in drilling to 50,000 ft. would be the high temperature.

However, there was little agreement about just how hot it would be. No one suggested that bottom-hole temperature at 50,000 ft. would be less than 450° F. (if drilled through sedimentary rocks). And, Van Dyke said heat might be as high as 1,175° F., although 875° F. might be more likely.

Anyway, panel members said that temperatures would certainly be too high for present materials and tools. Little of today's drilling materials is meant to withstand more than about 400° F. However, it appears that research now being done could extend temperature resistance of most material and equipment to as much as 700° to 900° F.

The rig . . . Abernathy said that as far as hoisting and pumping are concerned Americans could drill to 50,000 ft. soon.

It would mean, he said, putting 2,000 hp. on the pumps and operating them at 5,000 to 6,000 psi. continuously. Likely, the duplex pumps used today wouldn't be good enough for this. A plunger-type pump might be necessary.

Abernathy outlined a tapered drilling string for cutting hole at 50,000 ft. It included 4½-in., 3½-in., and 2⅞-in. drill pipe, some of it heavy wall P-150 quality. To keep a string of this high-tensile strength pipe together, he said, Americans need to develop better ways of handling it. The conventional hand-set slips now used would cause the pipe to fail. There shouldn't be any special problem in racking the drill string in the derrick.

Round trips wouldn't take too long from 10 miles down, Abernathy predicted. About 24 hours should be enough. For hoisting the full string, the derrick would have to be strung with 12 lines of 1½-in. high-strength wire rope.

The casing . . . Reynolds suggested a drill string slightly larger in diameter than that of Abernathy and of P-135 quality.

He said that pipe already used experimentally would be good enough to case the 50,000-ft. well.

For surface pipe, he proposed to set 2,000 ft. of J-55 24-in. Then, a string of 16-in. N-80 or P-110 pipe could be set to 10,000 ft. At 21,000 ft. Reynolds suggested a string of 10¾-in. P-150 and at 30,500 ft. a string of 7⅝-in. P-150. Then, a 5-in. liner of P-150 pipe could be run to total depth of 50,000 ft.

To keep hook loads down, Reynolds said the deeper casing strings should be run as liners on the drill pipe.

Muds . . . Van Dyke said some of today's muds have already been tested in the laboratory to 500° F.

He predicted some can be used at even higher temperatures. Van Dyke expressed confidence that, when the need arises, muds for still higher temperatures will be ready. Return mud would need cooling at the surface, but Van Dyke considered this no difficulty.

Mud weight, he said, may need to be no more than about 17 lb. per gallon in a 50,000-ft. well. There is a chance, though, that rocks at these depths might tend to deform plastically. If so, Van Dyke said, heavier muds may be needed.

One of the biggest mud problems may be high pressure drops in the annulus. These could be enough, Van Dyke speculated, to fracture the rocks and bring on loss of circulation.

Insulators . . . Steward put the finger on insulation troubles as the stumbling block in developing logging tools for a 50,000-ft. well.

Problem is, he said, that few materials keep their insulating and elastic properties at high temperatures. For example, the rubber covering on logging cables becomes inelastic and conductive at about 450° F.

Steward said new plastics work to 600° F. and he expects other materials to be developed soon for 700° F.

As for strength of logging cables, it's possible to design self-supporting cables to work to any depth.

Inside the logging tools themselves, temperature is again the bugaboo. Fortunately, the insulators there don't have to be elastic, As a result, ceramics and mica can be used.

Ceramic vacuum tubes have been tested to 900° F., but associated components like transformers, resistors, and amplifiers aren't satisfactory for as much as 700° F.

Steward said, however, the missile program might develop these components for higher temperatures.

Metals for bits . . . Payne pointed to three big problems for bits in a 50,000-ft. hole.

First, engineers will have to keep hole size big enough for rolling-cutter bits to be effective.

Otherwise drillers will have to resort to diamond or other drag-type bits. About 5⅝ to 6⅛-in. would be the smallest practical size rolling-cutter rock bit.

Second big problem, Payne said, will be the effect of pressures on drillability of the rocks.

In deep permeable zones, a filter cake might build up on the bottom of the hole thick enough to keep rock-bit teeth from reaching the virgin formation. If so, Payne suggested good jet-bit action as the only solution.

In impermeable zones such as shales, the tendency of the formation to deform plastically under pressure could render it impermeable to rolling-cutter action. If that were the case, a drag-type bit might be the answer.

Deeply buried sands would be compacted, stronger, and more abrasive than shallower ones. In spite of this, Payne expected those sands to drill with present rolling-cutter rock bits.

Third big problem is the metallurgy of the bits themselves.

Modern bits, Payne said, are made of a high-nickel steel. Deep carburizing gives this metal a file-hard shell around a softer core. However, this exterior softens or "draws" after long runs at 400° F. or more.

Metallurgists aren't ready now with a better high-temperature material.

Payne said he believes that to keep the bit below "draw" temperature in a 50,000-ft. hole, it will be necessary to refrigerate the mud not only while drilling but also while out of the hole.

It's coming . . . Owsley predicted a 50,000-ft. well will eventually be drilled.

When that day comes, he said, portland-type cements with any presently known retarders would be out of the question.

Pozzolanic materials seem to be the only answer. Owsley said that pozzolans with some retarders now known probably will give pumping times of 6 hours at temperatures above 500° F. Other materials also known but untested might work at 900° F.

Owsley said that floating equipment should be no particular problem. He added that cementing pumps now under construction will be capable of putting up 20,000 psi.

Texans Will Give Senator One-Day Schooling on Oil

RALPH E. YARBOROUGH, labor-backed junior senator from Texas, will receive a 1-day education in oil-industry problems January 27.

Problems confronting oil men will be outlined to the senator by spokesmen from five oil-industry organizations. The meeting will be held in Houston's Rice Hotel.

Backers of the forum indicated it might become the first of a series of meetings to which government leaders from various parts of the country would be invited to hear the oil industry's story.

Marlin E. Sandlin, vice president of Woodley Petroleum Co., will serve as general chairman of the Houston forum. The affair is described by its backers as "nonpolitical."

Each industry spokesman will be allotted 5 minutes to explain a particular industry problem. Senator Yarborough will be invited to comment on each topic.

Speakers and their subjects include:

. . . W. J. Goldston, district vice president, Texas Mid-Continent Oil and Gas Association, percentage depletion.

. . . Lloyd F. Thanhauser, American Petroleum Industry Committee, American Petroleum Institute, senate bill S-11 and other legislation.

. . . Raymond D. Reynolds, vice president, Texas Independent Producers and Royalty Owners Association, imports.

. . . Curtis Hankamer, vice president, Independent Petroleum Association of America, Harris-O'Hara natural-gas bill.

. . . J. U. Teague, president, American Association of Oilwell Drilling Contractors, plight of the small man in the oil industry.

New Wildlife Rules

get final approval despite strong oil-industry protest.

NEW REGULATIONS for oil and gas leasing of federal wildlife refuges and game ranges will be put into effect by the Interior Department almost as originally written.

The only change will make it clear that the final authority to approve leasing will be in the hands of Interior Sec. Fred A. Seaton.

The new rules announced last October brought strong protests from oil interests. A 2-day hearing was held before two assistant secretaries on December 9 which pitted oil producers against wildlife conservationists.

All leasing on wildlife refuges will be banned, except to protect against drainage. This will close off most of the 4,418,000 acres set aside for wildlife refuges.

Leasing will be permitted on the 4,616,000 acres of game ranges and 626,500 acres of federal-state wildlife lands not closed to development by the Fish and Wildlife Service.

Alaska . . . The 7,934,000 acres of wildlife areas in Alaska will be dealt with on the same basis as the game ranges.

Thirty-one leases—29 of them in the one unit plan—were approved by Seaton on the Kenai Moose Range. Additional areas of the range will be opened up in the near future.

Interior officials are confident that their plan to open up some 20-million acres of land in Alaska by repeal of Public Land Order 82 will get under way April 1, as scheduled.

About that time, Seaton said, the department will offer some 19,000 acres in Gubik gas field for competitive leasing and will accept applications for noncompetitive leases on 4-million acres northeast and south of the field.

The department later will open up much larger areas. But these must be mapped before leasing can start.

Union Wants Fund

. . . based on production. Issue may be injected into negotiations this year, OCAW president tells members.

OIL WORKERS, in negotiating for wages in 1958, may ask for extra payments based on production.

President O. A. Knight of the Oil, Chemical and Atomic Workers International Union told the union in his "year of decision" message that it should consider supplementing hourly wage with "royalty payments on company production."

By "royalty payments," Knight said he meant that the company could create an employe fund supported by payments based on production.

"Such fund could be held, under joint union-management administration, as a savings and emergency fund for the employes affected, with each employe personally credited for his pro rata share," Knight said.

The union chief contended that management should favor such a plan because the company would "pay such royalties only in proportion to actual production, with costs reduced when business is down."

"Our wages are much too low," Knight said. "The average oil or chemical worker should be making $5 or more an hour, with top-skilled men making more. Most oil and chemical companies could pay such rates and still retain more profits than they did half a dozen years ago.

"There is resistance to such wages, so perhaps we should consider supplementing our hourly wages with royalty payments on company production."

In basing the payments on production, Knight said the production would consist of whatever the plant makes—barrels of oil, gallons of paint, tons of chlorine, pounds of toothpaste, or gross of aspirins.

The plan, he added, would give the worker a chance "to share in the benefits of automation."

"The age of automation is with us and the full force and impact of this is now being felt."

Shorter hours . . . The union president made no mention of 1958 wage goals during the address, but warned that a shorter work week will be sought if automation and business downturns result in a large layoff of workers.

"If there is not enough work to go around on the present 40-hour week basis, then the work available should be shared by all with the work week shortened by whatever amount is necessary," Knight said.

"I suggest no rigid formula in this respect, but I do suggest that both workers and management prepare now for the shortening of the work week if and when necessary—and that may be soon."

Later, however, Knight told a conference of 140 workers and officials at Denver there is no plan to seek a shorter work week "in the immediate future."

"What we have done is to gather our research data and formulate preliminary plans so that if consideration of a shorter week becomes necessary in the future, we won't have to start from scratch in our planning," he said.

OCAW's 52-member bargaining policy committee, made up of rank-and-file members, would have to approve any program for a shorter work week. Knight said there are no plans to call the committee into session at this time. The committee normally meets in the fall to plan for the following year's negotiations, although it did not meet in 1957.

Two goals . . . Knight called on the union membership to review carefully changed conditions which demand new ideas in trade unionism. He outlined two functions the union must perform within the next few years.

"First," he said, "it must protect the security of older workers already employed in our industries. Second, it must expand the opportunities for advancement for young people in this age of electronics."

Knight said management should join OCAW in helping older workers affected by any change of equipment or production method. Senior employes threatened with displacement should be given in-plant retraining for new job duties required by new equipment.

"If a layoff becomes unavoidable, as in the case of the shutdown of an entire plant, the laid-off employe should receive a large severance payment," Knight said. "Such payment should run into the thousands of dollars for men of several years service."

As for younger workers, he believed most labor unions, including OCAW, have failed to recognize the needs of the "ambitious young man."

"As a labor union," Knight said, "we need to devise methods of helping young men achieve their ambitions. We need to encourage both in-plant training and additional educational opportunities in the new technical jobs."

Knight said he plans to make specific recommendations for 1958 after conferring with other OCAW officers and union members.

"A year of decision faces the members of OCAW," he declared. "Changing times have brought a new set of problems and a new set of opportunities to the employes of oil, chemical and atomic companies. New goals and methods on the part of the union are called for."

Navajos Win Round

in battle to retain bonuses from Four Corners land.

THE INTERIOR DEPARTMENT has cancelled a recent order impounding more than $2,600,000 paid by oil companies for expensive Navajo Reservation leases in the oil-rich Four Corners area of southeastern Utah.

The cancellation came after Tribal Attorney Norman Littell protested the impoundment in Washington. Littell hailed the action as "an act of good government to admit an error and correct it as soon as it is recognized."

The bonus payments were made to the Navajo Tribal Council December 10 at a lease sale in Window Rock, Ariz., but the money was impounded after residents of Salt Lake City claimed title to the land through placer-mining claims filed in the 1890's.

John Archer, Salt Lake City lease broker, argues that the placer-mining rights are still valid and that the land is public domain and not part of the Navajo Reservation. The land was added to the reservation in the early 1900's.

Archer said he hopes to patent the claims and gain rights to all minerals underlying the claims, which could mean that a lengthy legal battle is in prospect.

The four tracts in question are in the Montezuma Creek Canyon area of San Juan County, a few miles west of the Colorado border. Bids on the leases for the 3,800 acres involved range as high as $4,038 per acre, paid by Carter Oil Co. Other successful bidders included The Texas Co. and Phillips-Aztec.

Littell said that cancellation of the impoundment "reflects the intention to protect the Navajos from the effects of special influences. Perhaps all interested parties have learned the Navajos will not run whenever some title claimant yells 'boo'."

Gulf Plans Big Year

with record-breaking outlay. Firm slaps at pessimism.

GULF OIL Corp. plans a capital outlay this year of $692 million, the highest in the company's 56-year history.

Gulf's management disclosed the record spending program in an announcement which took sharp issue with "the gloom" which "events of 1957 seem to have plunged a large portion of the business and financial community of the United States."

"The management of Gulf does not believe that the exile of one Russian dog into outer space, which presumably is colder and even less habitable than Siberia, is the end of the world."

The announcement followed by only a few days a similarly optimistic disclosure made by Eugene Holman, board chairman of Standard Oil Co. (N.J.). Holman said Jersey plans to spend $1,380,000,000 during 1958 (OGJ, Jan. 6, p. 67).

Gulf's planned capital expenditures include:

. . . $564 million for expansion and improvement of production, refining, transportation, and marketing facilities. Gulf says virtually all of this figure will be spent in the Western Hemisphere.

. . . $128-million for geophysical exploration, wildcat drilling, and other work necessary to find new oil reserves. Of this total, three-fourths will be spent in the United States, Gulf said.

The company plans to continue and expand its exploratory operations in other parts of the world also.

Kansas Crude Line Planned

Jayhawk Pipeline Co. has received a certificate from the Kansas Corporation Commission to build a 242-mile 10 and 12-in. crude line from southwestern Kansas to Wichita. Jayhawk is a joint venture of National Cooperative Refinery Association, which has a plant on the route at McPherson, and Colorado Oil & Gas Corp., parent of Derby Refining Co., Wichita.

Jayhawk must submit financing and tariff plans later. The company plans an originating station in Meade County and a booster at Chase, Kans. The line, with initial capacity of 15,000 bbl. daily and ultimate capacity of 45,000 bbl. daily, is to be completed in August. It will serve southwestern Kansas and northwestern Oklahoma fields which are shut in or served by truck.

Pipeline briefs

Transcontinental Gas Pipe Line Corp. is building a gas treating and dehydration plant in McMullen County, Texas, with capacity of 75,000,000 cu. ft. per day. Contract to design, engineer, and build the $2,000,000 plant has been awarded to Fluor Corp., Ltd. It will be completed in July.

Magnolia Pipe Line Co. will complete a looping program raising the capacity of its West Texas-Beaumont crude system 75,000 bbl. to 235,000 bbl. per day. O. R. Burden Construction Corp., Tulsa, is winding up 121 miles of 16-in. and 5 miles of 12-in. between Midland and Corsicana. H. B. Zachry Co. earlier laid 77 miles of 12, 16, and 20-in. between Midland and Beaumont, Tex., in the 203-mile program, which also included station expansion.

A practical "Short Course for Pipeliners" will be conducted in Houston January 23 and 24 by the Houston Section of the National Association of Corrosion Engineers. Subjects for classroom instruction will be corrosion fundamentals, cathodic protection, external coatings, internal corrosion control, coatings for tanks and aboveground structures, and design, construction, and maintenance planning for corrosion prevention.

Chairman of the short course is O. W. Wade, Transcontinental Gas Pipe Line Corp. Vice chairman is Walter Noser, Humble Pipe Line Co.

Arkansas Louisiana Gas Co., as a further move toward diversification, has purchased Pitts & Bryant Co., Inc., a pipeline and utility construction firm of Clarkesville, Ark., and Lafayette, La. General offices will be moved to Little Rock and the firm will be operated as a subsidiary.

Pioneer Natural Gas Co., Amarillo, Tex., is negotiating for the purchase of Empire Southern Gas Co., Fort Worth. Empire stockholders have been asked to approve the sale of all Empire properties and assets for 187,818 shares of Pioneer stock, or the equivalent of more than $4 million. Empire has some 300 miles of small-diameter transmission lines and 600 miles of distribution lines in West Texas. A subsidiary, Empire Southern Producing Co. operates in West and Central Texas and the Panhandle.

Interprovincial Pipe Line Co. has budgeted $10 million for expansion of its 1,931-mile crude system which extends from Edmonton to Toronto.

The 1958 program includes 82 miles of 24-in. loops in Alberta and Saskatchewan. The loops are in four sections starting from stations at Edmonton and Hardisty, Alta., and Kerrobert and Loreburn, Sask. The loops will complete a double line from Edmonton to Superior, Wis. Interprovincial's U. S. subsidiary, Lakehead Pipe Line Co., Inc., will build a new remote-controlled 4,400-hp. electric pump station at Bay City, Mich.

The expansion will increase capacity to 275,000 bbl. daily from Edmonton, 379,000 bbl. daily from Cromer, Man., and 261,000 bbl. daily from Superior to Ontario.

The Interstate Commerce Commission will no longer use the services of the American Petroleum Institute in making oil-pipeline valuations. ICC Chairman Owen Clarke, who is about to retire, has informed Rep. Emanuel Celler of New York that the commission will no longer work with the API's engineers-accountants valuation committee. Instead, Clark said, ICC will set up its own advisory committee to be headed by a government chairman. Members will be selected from company nominees. Celler last fall criticized the ICC-API setup in hearings before his antitrust subcommittee.

Also for Pipeliners . . .

IN THE NEWS: FPC may ask Congress to pass a law reversing effect of Memphis case on natural-gas pipeliners (p. 52) . . . Transco is nearing completion of a 151-mile stretch of 24-in. line tapping gas reserves in three Southwest Texas counties (p. 53) . . . House Speaker Rayburn says the Harris bill will pass this year (p. 53) . . . New West Texas money is backing long-talked crude line to California (p. 58) . . . Fate of unconnected West Texas wells now rests with Texas Railroad Commission as arguments end in case (p. 58).

PLUS THESE TECHNICAL REPORTS: Cities Service uses p.d. meters for LACT (p. 74) . . . Protecting pipeline stations against electrical transients (p. 103) . . . On the Job in pipelining (p. 117).

Flood Test Set for Big Foot

. . . in Frio County, Texas, where Shell is hoping to increase recovery from Olmos "B" sand. Pilot project is planned.

SHELL OIL CO. is planning a pilot flood which could grow into a grand-daddy-sized project in Big Foot field of Frio County in South Texas.

The project will determine whether the Olmos "B" sand under Shell's 320-acre A. F. Meyer lease can be flooded.

The company already has proved the feasibility of gas injection in the Olmos. But it wants to see if a water flood might perform better.

Big Foot is a strat-trap pool of 10,400 acres and 542 wells. It has never been highly prolific, despite its cumulative production of nearly 11,000,000 bbl. Discovered in January 1949, it has experienced two development spurts.

The first ended in late 1951 with about 115 wells completed. Large-scale development waned when operators became disappointed with the poor performance of early wells.

Then, in 1952, hydraulic fracturing was used to stimulate production. It was so successful that another field-wide development program resulted. Development now is nearly complete.

Although fracturing probably increased ultimate oil recovery from the field, the rate of decline in production of Big Foot wells indicates a low recovery efficiency. Shell feels that Olmos can be flooded, despite its low permeability, and ultimate recovery raised substantially.

The flood plan . . . The hope for success is based partly on results of a water-injectivity test started on the company's J. S. Bordovsky lease last January. Through November 25 the company injected 23,255 bbl. of water through a lone test well at a pressure of about 750 psi.

Shell says it has not yet noted any response in surrounding producers but believes this is due to the open-end nature of the flood. To get more data, it plans to convert 17 producers to input service in nine 20-acre, five spots. Injection rate will be 100 to 200 bbl. per well per day at a surface pressure not exceeding 1,000 psi. Injection water will come from the Olmos "C" sand.

Shell figures with this setup it can evaluate the merit of a full-scale flood over a large area of the field.

The project has been approved by the Texas Railroad Commission.

Two more proposed . . . The commission is mulling over applications for two more floods which together would recover nearly 5,000,000 bbl. of added oil over primary.

Both are planned for Winkler County in West Texas.

Champlin Oil & Refining Co. wants to flood the Yates sand under 640 acres of its leases in Emperor field.

George L. Buckles Co. proposes a flood of the Yates under five leases totaling 343 acres in Kermit field.

Primary production of these leases is on its last legs, with 82 per cent of the wells plugged and abandoned. The six wells remaining are averaging 1.1 bbl. per day each. Cumulative production is 1,044,743 bbl.

Demand to Climb

says Bureau of Mines, but domestic output will drop.

THE BUREAU OF MINES says domestic demand for oil will climb 2.5 per cent in 1958—higher than last year's increase, but much lower than the average annual increase for 1946-56.

Domestic demand will average 9,024,000 bbl. daily, compared with last year's demand of 8,803,000 bbl. daily. Last year showed only a 0.3 per cent increase over 1956. The increase in demand averaged about 6 per cent in the 10 years following World War II.

The bureau says that although domestic demand will show an increase this year, total demand—which includes exports—is not expected to change much from 1957's 9,367,000 bbl. daily.

Other predictions:

. . . Crude production will average 7,037,000 bbl. daily. This is 1.8 per cent below 1957.

. . . Crude-oil imports will be 990,000 bbl. daily, if the imports control program is carried through the second half of the year.

. . . Exports of both crude and products will average only 345,000 bbl. daily. This is nearly 39 per cent below last year's figure.

. . . Crude runs to stills will stay about the same as last year at 7,927,000 bbl. daily.

. . . Gasoline and fuel-oil domestic demand will increase, but at lesser rates than has been normal since the end of World War II.

The bureau said the forecast assumes crude-oil imports in conformity with the controls program, and a business improvement over the fourth quarter of 1957.

West Coast Buyers

to outline crude purchases from Four Corners line.

THE NEW MEXICO Oil Conservation Commission has asked West Coast crude buyers to outline their plans for purchases from the new Four Corners pipeline.

Buyers are requested to send representatives to the commission's January 15 meeting in Santa Fe. The commission wants to know how much to boost production when the new pipeline to the West Coast goes into operation next month.

Last month the commission cut January allowables from 28 bbl. to 11 bbl. per well per day for fields in northwestern New Mexico, after the nearly-completed pipeline was almost filled (OGJ, Dec. 30, 1957, p. 116).

Dan Nutter, commission engineer, said the commission hopes to get definite information about market potential for the Four Corners line so that allowables can be quickly adjusted upward.

Completion of Four Corners Pipe Line Co.'s 721-mile crude carrier from Bisti field in New Mexico and the Aneth area of southeastern Utah to Los Angeles will mean an entirely new market for Four Corners crude.

Another line will move Four Corners crude to southeastern New Mexico when it is completed next spring. This is Texas-New Mexico Pipe Line Co.'s 512-mile line, which will put Four Corners crude in competition with crude from southeastern New Mexico.

The commission will probably adopt a uniform allowable for the entire state when both the lines are in operation.

TGT Swaps Pipeline Stock

TENNESSEE GAS Transmission Co. has completed disposal of its interest in Trans-Canada Pipe Lines, Ltd.

President Gardiner Symonds of Tennessee Gas announced that the transaction with Home Oil Co., Ltd., involved an exchange of Trans-Canada stock for an interest in producing oil properties plus shut-in and undeveloped gas properties, all in Alberta.

Oil production acquired by TGT

amounts to about 800 net barrels per day. Included are interests in 960 acres of leases in Harmattan field and 640 acres in Pembina field.

Gas reserves acquired in the transaction are estimated at 39 billion cubic feet. Gas properties are in Nevis field.

Contract for exchange of the properties was signed in October.

NPC Future Shaky

after Seaton aide doubts legality of council setup.

FATE of the National Petroleum Council as now set up rests this week with Atty. Gen. William P. Rogers.

Chairman Walter S. Hallanan and council members have scheduled a meeting with Interior Secretary Fred A. Seaton and Justice officials to settle one question: Shall the NPC be required to meet the conditions laid down for business advisory committees.

Question of the NPC's legality was raised by Seaton's solicitor. The secretary advised Hallanan last month that he was convinced the council should follow the Justice Department's rules.

An NPC delegation headed by Hallanan met with Seaton last week, but failed to reach an agreement.

The Justice rules call for full-time government employes to act as chairmen of advisory groups. Meeting dates must be set by the Government, and full and complete minutes kept.

The NPC has been headed by an industry man ever since it was set up in 1946 as successor to the industry's war council.

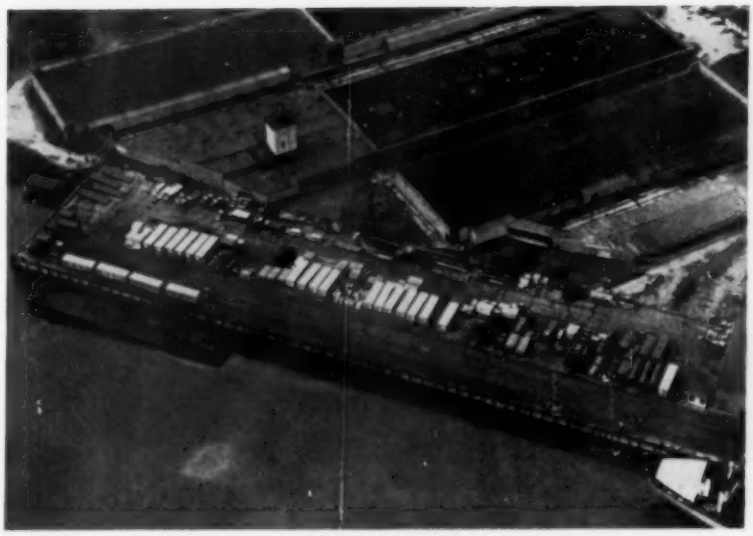
Previous Interior secretaries have fought to keep the NPC free from restrictions. Seaton made it clear he will not challenge the Justice Department.

The rules for advisory committees are in the hands of the Attorney General, Seaton pointed out. "I intend to comply with what the Attorney General tells me," he said.

It is Hallanan's contention that since previous administrations held that all the criteria laid down by Justice did not apply to the council, there is no reason for a change of position now.

Hallanan has advised the council members that compliance with the rules would mean dissolution of the NPC as it now exists.

Seaton refused to confirm this. "I wouldn't go that far," he said. "Rather, there are stern objections to some of the criteria as applied to the NPC."



EQUIPMENT stacked on Houston dock means . . .

New Drilling Rigs for Iran

TWO DRILLING RIGS and related equipment valued at approximately $3,000,000 were shipped from Houston last week for drilling in Iran.

Seacat Drilling Co. of Iran, S.A., a firm organized by Texas and Middle East interests, will use the equipment to fulfill a long-term drilling contract with Iran Oil Co. Iran Oil is a subsidiary of National Iranian Oil Co.

Southeastern Drilling Corp., Dallas, is part owner of Seacat Drilling. The Dallas firm handled arrangements for the shipment in this country.

The equipment, shown above at dockside, was loaded on the S.S. Steel Maker for a 32-day voyage to Khoramshahr, Iran, on the Persian Gulf.

The cargo includes two Oilwell 96 rigs, complete with drill pipe and other supplies, 34 portable houses, and various transportation equipment.

Seacat will maintain headquarters at Teheran. The nucleus of the drilling crews has been recruited in the U. S.

A spokesman for J. P. Harle Forwarding Co., which handled the shipment, said the drilling rigs were assembled and tested at Houston before being shipped.

Buyer Discrimination Charged

THE TEXAS Railroad Commission has set for hearing January 17 charges that crude-oil purchasers in East Texas field are illegally discriminating against certain producers.

The petition for hearing was filed by United Gathering System, a combine of Western States Investment Corp., Wrather Petroleum Corp., Jaydee Oil Co., J. D. Wrather, Jr., and Mrs. Mazie Wrather.

The producers claim that crude buyers in the field have refused to buy United Gathering's full allowable when offered the crude on the same terms on which they are buying from other East Texas producers.

The complaint names Cities Service Oil Co., Shell Oil Co., Tidewater Oil Co., The Texas Co., Crown Central Petroleum Corp., Texas Pipe Line Co., Sohio Petroleum Co., Phillips Petroleum Co., Gulf Oil Corp., and Humble Oil & Refining Co.

Volume of oil at issue amounts to about 2,000 bbl. daily. It formerly was gathered for the account of Phillips Petroleum Co.

In recent years, the commission has achieved ratable take in similar cases in smaller fields by lowering the number of allowable days for all wells in the field to the point where a buyer could take oil from all of them. It is impractical to do that in East Texas field, however, because 1 day's production in the huge field comes to more than 100 times the volume of the distress oil.

So far, the commission has never ordered a purchaser to buy oil in order to achieve ratable take.

Some observers feel, however, that this is no reason to expect that the commission won't some day take such action if it sees no better course. The East Texas case could, they say, present this kind of situation.

World Exposition Lures Oil Exhibitors

THE WORLD'S biggest oil exposition is still 16 months away, but more than 71 per cent of the exhibition space is already booked up.

William B. Way (second from left in photo), general manager of the International Petroleum Exposition, points to a map of the Tulsa exposition grounds to illustrate the early demand for space. The show will be held in Tulsa May 14-23, 1959.

Most of the space already contracted was committed to exhibitors at previous expositions. Requests from new exhibitors will be handled as soon as all options expire. Price schedules will be available by March 1.

Left to right in the photo are Leslie Brooks, public-relations director for the show: Way; J. L. Shakely, president of Oklahoma Mississippi River Products Line, Inc., and treasurer of the show; and Johnny Bridenthal, assistant manager of the exposition.

Long Beach Calls Truce

. . . in battle to halt subsidence. City council may go along with small flood in first step to check wide-spread damage.

THE LONG BEACH City Council and the city's harbor department decided to bury the hatchet last week in the battle over how to check subsidence in California's Wilmington pool.

The council said it would approve a proposal to inject 180,000 bbl. of water daily into the field—if the program is tailored to fit into an eventual 1,000,000-bbl. daily water flood. Experts say it will take a flood that large to halt subsidence.

A hassle between the two groups was touched off last month when consultants for the council argued that a 180,000-bbl. flood might not fit into the long-range plan for the larger flood. Consultants for the harbor department disagreed (OGJ, Dec. 23, p. 40).

Warning from Navy . . . One spark behind last week's peace pact was another warning from the Navy, which has spent millions in repairing damage at the Long Beach Naval Base.

"Time has run out," Rear Admiral Ralph K. James, commander of the base, told a group of visting state senators last week. "This is a critical period for us and our 6,300 yard employes."

He said that the next couple of months will tell whether Congress will continue to pick up the expensive bills for building dikes and raising buildings because of a 20-ft. subsidence at the base.

City pays big bill . . . Long Beach has also shouldered heavy expenses for repairs at the city's modern harbor. The city spent $2.6 million for damages resulting from a 1.2-ft. subsidence during 1957 alone. This brought the total sinkage at the center of the area to 24.5 ft.

The Long Beach Chamber of Commerce and the Long Beach Naval Shipyard Association have collected more than 40,000 signatures urging action at the state's 1958 legislative session.

—*Processing* briefs

Baker & Co., Inc., maker of the Sinclair-Baker platinum reforming catalyst, is the largest of nine American companies to be consolidated into Engelhard Industries, Inc. The group is primarily interested in precious and noble metals. Baker makes catalyst for about 20 per cent of all reforming capacity in the U. S.

Wilshire Oil Co. has completed a 21.3-mile, 12-in. pipeline from its offshore unloading terminal at Huntington Beach to its Norwalk, Calif., refinery. The line is designed to move fuel oil from the refinery to the terminal as well as transport crude from the terminal to the refinery.

Pure Oil Co.'s new 12,000-bbl. catalytic reforming unit is now on stream at the company's 48,000-bbl. Lemont, Ill., refinery. The unit was designed and built by M. W. Kellogg Co.

Berry Asphalt Co., which operates two small refineries in Arkansas, has been sold to a group headed by W. C. Blewster, president of the First National Bank of Magnolia, Ark. H. B. Pullar will continue as president of the firm. The company has a 2,000-bbl. plant at Stephens and a 1,300-bbl. refinery at Waterloo.

Stauffer Chemical Co. will build a large hydrofluoric acid plant adjacent to its petrochemical plant at Louisville, Ky. Hans Stauffer, president, said the decision to build the new plant was based on the rapidly expanding demand for hydrofluoric acid, which is used in the manufacture of refrigerants, aerosol propellants, aviation gasolines, rocket propellants, and as a processing chemical for uranium.

Also for Refiners . . .

IN THE NEWS: Canada plans to make a big issue of West Coast imports control. It fears restrictions, though small now, will restrict plans for expansion (p. 51) . . . Crude price cuts continue but they're being kept small and local (p. 57) . . . Petrochem row rising along the Mississippi River between Baton Rouge and New Orleans may soon rival Houston-area complex (p. 60) . . . OCAW may counter management resistance to wage raises this year with proposal that workers get extra pay based on production (p. 64). . . .

PLUS THESE TECHNICAL REPORTS: New cracking process for acetylene and ethylene (p. 78) . . . Catalyst erosion in cat crackers (p. 81).

Mattei Mad at Americans

. . . over loss of Libyan concession. Italy's oil head says U.S. firms are fighting his drive to get foreign acreage.

ENRICO MATTEI, head of Italy's government oil agency, angrily confirmed last week the rumor which has been prevalent for months—he lost out in a bid to look for oil in Libya.

Nettled by a public announcement that another American oil company has been granted exploration acreage, Mattei complained bitterly that American oil companies have "done a nasty thing to Italy in Libya."

The head of Ente Nazionale Idrocarburi implied that United States pressure was brought to bear to keep ENI out of Libya. He explained that he did not refer to the U.S. Government. He did not name any specific company.

The concession Mattei wanted was granted to Texaco Overseas Petroleum Co. and California Asiatic Oil Co. last week (OGJ, Jan. 6, p. 88). Exploration work for the two companies will be done by American Overseas Petroleum Co., the exploration company of the Caltex Group.

Mattei said last week that ENI had asked for a 21,000-sq.-mile concession in the Fezzan region of southwestern Libya. During the negotiations, he said, Libya indicated that it might be willing to grant a concession of some 17,000 sq. miles.

He said a formal agreement was drafted last August, but was never signed because the regime of Premier Mustafa ben Hamlim went out of power. After that, Mattei says, the signing of the agreement was postponed repeatedly. Then, in November he was notified that ENI would not receive the concession.

Since November Italy has tried by formal diplomatic action to get ENI's deal reinstated with no results.

At the same time he charged his agency was squeezed out of Libya, Mattei repeated the charges he has made previously that Americans tried to shut him out of the Middle East. He said ENI had been treated "in an unpleasant way" in its efforts to gain a foothold in Middle East oil.

American reaction . . . Oil men in the United States would not comment officially on Mattei's charges. But several did have some pointed things to say privately.

"After he's been in the oil business a little while, he'll learn to lose a concession with a little more grace," one official commented.

Others could think of a number of reasons for Mattei's lack of success. None of them had anything to do with American pressure on Libya. The head of ENI mentioned one of them himself. He said his negotiations for a concession began last sping when Premier Hamlim was visiting Rome.

Americans pointed out that the Libyan oil law sets out a very definite procedure for obtaining an oil concession. Political negotiations with the Libyan premier are not included in that procedure.

The Libyan Petroleum Council in a policy session decided not to grant any more oil concessions to companies controlled by foreign governments. ENI is wholly owned and controlled by Italy's Government.

Before this policy was set, both British Petroleum Co., Ltd., and Cie. Francaise des Petroles were granted Libyan concessions. They are controlled by the British and French governments. Both were in the original rush to gain Libyan concessions 2 years ago.

One requirement for a concession in Libya is satisfying the country's petroleum commission of your financial and technical ability. Mattei insisted last week that his loss of the concession did not involve "a question of money."

Americans pointed out, however, that he might have had trouble convincing Libya of his company's technical ability. ENI has shown a notable lack of success in developing oil production in Italy's Po Valley where it has a monopoly.

Mattei's company has succeeded in developing gas production which last year averaged an estimated 454,000,000 cu. ft. daily, but its daily oil production amounted to only about 3,300 bbl. Most of the oil came from a recently discovered field in Sicily. Only about 1,000 bbl. daily came from the Po Valley and other Italian mainland areas.

Finally, American oil men point out that the Italians are the former colonial masters of the Libyans. In few places are newly independent people particularly fond of the nationals of a country which once ruled them.

Pan American Quits Jamaica

. . . and turns to Cuba with offshore test at Tortuga Shoals. Drilling now is below 1,000 ft., is scheduled to 9,000 ft.

PAN AMERICAN Petroleum Corp. has given up its prospecting licenses on the island of Jamaica, after drilling three dry holes, and is directing greater effort at finding oil in Cuba.

A company subsidiary, Pan Jamaican Oil Co., took over the Jamaica licenses in early 1956 from Base Metals Mining Corp., under a joint agreement between the two firms and the government.

Since that time Pan Jamaican has drilled three unsuccessful exploratory tests at onshore locations in the 8,600-sq.-mile license area covering the entire island.

The tests were:

. . . Santa Cruz 1, carried to a depth of 8,732 ft., location 60 miles west of Kingston, in the south-central sector.

. . . Cockpit 1, drilled to 5,521 ft., 40 miles north of the Santa Cruz location in West Central Jamaica.

. . . West Negril 1, drilled to 9,244 ft., at the extreme western end of the island. The well was abandoned late last August.

Cuban drilling . . . The rig used at West Negril 1 has been moved to Cuba and is drilling at Tortuga Shoals 1, an offshore test of Cuban Stanolind Oil Co., another Pan American subsidiary.

The wildcat is located on a man-made island 19 miles off the south-central coast of Cuba.

Last week the well was drilling at 1,060 ft. and is scheduled to test the Cretaceous, expected at about 9,000 ft. It is on an anticlinal structure located by seismograph.

Cuban Stanolind so far has drilled two shallow exploratory dry holes and a number of stratigraphic tests within its concession acreage in Cuba and its offshore areas.

Sun Group Hits Again

. . . with major flush producer on Lake Maracaibo Block 1. It's sixth big well within tiny radius in middle of lake.

A SMALL, prolific patch of real estate in the middle of Lake Maracaibo had another flush producer last week when the Sun-Atlantic-Seaboard Group completed its second major well on Block 1.

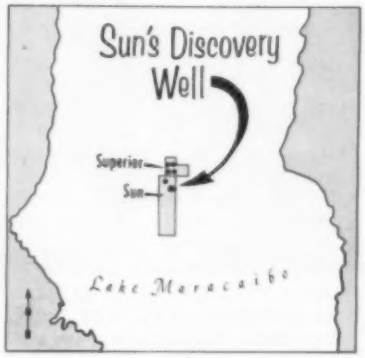
The SVS-4 tested at the rate of 6,063 bbl. daily of 31.6°-gravity crude through a ¾-in. choke. It is the sixth big well drilled within a radius of 1½ miles in a remote lake area.

The five wells so far tested within this imaginary circle flow a total of more than 34,700 bbl. daily. Two were drilled by the Sun Group, and three by Superior Oil Co. The sixth well, Lama 2, drilled by Superior, has encountered 1,413 ft. of oil sands.

SVS-4 flowed from perforations in a 98-ft. section of basal Eocene horizon from 9,484 ft. to 9,582 ft. The other wells also produce from Eocene.

Venezuelan Sun Oil Co., the operator, bottomed SVS-4 at 9,687 ft. Approximately 1,300 ft. of oil-bearing sand was encountered.

The well is in the northeast corner of the 24,710-acre block. It is about 1 mile east-southeast of Sun's first big hit, SVSX-5. This well tested 7,080 bbl. daily of 32°-gravity crude through a ¾-in. choke from 9,470 ft. to 9,579 ft. (OGJ, Dec. 9, p. 87).



Nest of producers . . . Both Sun wells lie within shouting distance of Superior producers on a 7,774-acre tract to the north.

SVS-4 is 2 miles due south of Superior's Lama 5. This well tests at better than 7,600 bbl. daily from a 134-ft. section. Lama 7 is 1 mile north and slightly west of No. 5. Nos. 6 and 7 wells are both in the 7,000-bbl. daily class. Lama 2 is 1 mile north and slightly west of No. 6.

The Sun Group has drilled three wells on Block 1. The first, slightly west of SVS-4, is a small producer by Venezuela standards.

Superior has drilled a total of five wells. Its Lama 1, about 2 miles due north of Lama 5, tests 3,300 bbl. daily from perforations in 196 ft. of Eocene.

Sun and Venezuelan Atlantic Refining Co. each have 45 per cent interest in Block 1. Seaboard Oil Co. has 10 per cent interest. They paid $733.40 per acre. Superior paid $2,831 per acre for its block.

Other wildcats . . . Two other important wildcats are approaching the critical depths in testing unexplored lake tracts.

The San Jacinto group has LSG-0-1, its first well in Block 10, at 12,200 ft. and expects the next 2,000 ft. to tell the story. The same group also has its Marlago 2 near 6,000 ft. in the lake's eastern section. The first test flowed at 5,760 bbl. of oil daily (OGJ, Dec. 16, p. 57).

The Phillips group has run into trouble on its LPG-1-1 in Block 17. Crew is sidetracking tools at 12,400 ft. after reaching a depth of 12,900 ft. when it lost a fish.

Australian Acreage

attracts Texas firm. Delhi says geology looks good.

DELHI-TAYLOR Oil Corp., Dallas, is considering joining with an Australian company to explore a 60,000,000-acre concession in Australia's states of Queensland and South Australia.

The Australian firm, Santos, Ltd., of Adelaide, approached Delhi-Taylor through Dr. A. I. Levorsen, Tulsa geological consultant. A Delhi-Taylor delegation headed by Clifford Smith, vice president of production, toured the concession last year and was generally pleased with the results.

The concession is about 300 miles wide and 310 miles long, bisected by the boundary between South Australia and Queensland. It is an area of desert and sheep rangeland. Geologically, most of it is in the Great Artesian basin.

Oil shows reported . . . Delhi-Taylor geologists currently are studying exploration data assembled by Santos. This consists largely of surface work and data from core-hole drilling from 800 to 1,500 ft.

Santos last September reported oil shows in the Cretaceous in a strat test drilled to 1,322 ft. near Oodnadatta on the west side of the basin.

The available geological data is excellent, Delhi officials say, but there isn't much of it for such a huge area. Nevertheless, it is sufficient to indicate the possible presence of effective trap conditions.

When Delhi completes its study of the Santos data, it will decide definitely whether to negotiate further.

Paria Has Oil Shows

as offshore test cuts more than 30 ft. of possible pay.

VENEZUELA, which recently has had a rash of new oil discoveries in Lake Maracaibo, soon may have its first offshore producer in the Gulf of Paria.

First wildcat in the Venezuelan area of the gulf was officially reported last week to have found some shows. Details were withheld, but one unconfirmed report indicated the test had more than 30 ft. of oil sand.

The test is being drilled by Paria Operations, Inc., operator of offshore concessions covering some 152,000 acres. Paria Operations is a joint venture of Continental Oil Co., The Texas Co., Ohio Oil Co., Cities Service Co., and Richfield Oil Corp. (OGJ, Oct. 14, 1957, p. 121).

The wildcat is about 6 miles offshore. It was plugged back and sidetracked after drilling below 4,900 ft. The sidetracked hole last week was nearing 4,000 ft.

Gulf Takes Turkish Farmouts

D. D. FELDMAN Oil & Gas of Dallas has farmed out 75 per cent interest on 13 Turkish exploration licenses to Gulf Oil Corp.

A wholly owned Gulf subsidiary, Turkish Gulf Oil Co., will be the operator for the two companies. The licenses cover 1,500,000 acres in several parts of Turkey. The Turkish Petroleum Administration has approved the deal.

Several companies already are drilling on concessions granted 2 years ago. A three-company group led by Tidewater Oil Co. was the latest to get a wildcat under way. The test is in the Mount Bakuk area in the southeastern part of the country (OGJ, Dec. 23, p. 54).

Colombian Block

may go to Ambassador Oil. 40,000-acre deal hinges on exploitation rights.

AMBASSADOR OIL CORP., Fort Worth, last week was on the verge of plunging into its first foreign oil venture.

Headed by F. Kirk Johnson, the company is expected to take over a 40,000-acre concession in Colombia before January 21 from Dr. Victor Oppenheim, partner in the Dallas petroleum consulting firm of Oppenheim & Briscoe.

In Dallas, Oppenheim said Ambassador already had taken over the concession. Ambassador officials, however, said this wasn't so. The deal, they said, hinges on converting the concession from exploration to an exploitation type. It was indicated this would be accomplished in short order.

The acreage lies along the Sinu River about 100 miles south of the Caribbean Coast in the State of Cordova. Geologically, it is in the Sinu basin, surrounded by acreage held by Sun Oil Co., Socony Mobil Oil Co., Inc., and International Petroleum Co.

The concession was originally held by Socony which completed two shallow wells on the acreage then relinquished it. Oppenheim, who served the Colombian Government as consultant, negotiated with the government for the acreage and has held the concession for several years.

Oppenheim said he retains an overriding interest in any production developed. His deal with Ambassador binds the latter to start exploration immediately and to drill at least two wells a year for several years, the consultant said.

An Ambassador executive confirmed this, provided the exploitation agreement is finalized. Two Ambassador officials were in Colombia last week to try to close the deal.

There is some reason for haste because the old exploration concession expires January 21. Ambassador, if it wangles the exploitation concession, would have 4 months to develop production.

The company would meet this requirement, according to Oppenheim, by renovating the two old wells which produce from about 1,500 ft. Later, he said, the company would schedule deeper drilling to 8,000 or 10,000 ft.

If production were developed, Ambassador would lay a short pipeline to the Sinu River and barge the oil to International Petroleum Co.'s coastal refinery at Cartagena.

A NEW BARGE is outfitted at Das Island for . . .

Expensive Test in Persian Gulf

ONE OF 1958's first big-time wildcat gambles will start soon when the first submersible drilling barge ever brought to the Persian Gulf begins a remote offshore test.

The "Adma Enterprise" is being fitted at Das Island. Abu Dhabi Marine Areas, Ltd., will tow it from Das to a location 20 miles northwest, near the center of the widest part of the Persian Gulf. After the legs are lowered, the barge will be raised 40 ft. above high water.

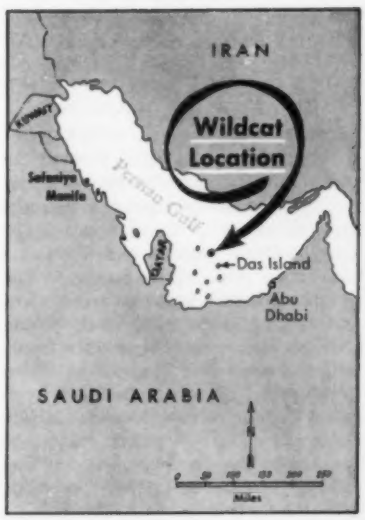
The wildcat will be the first on a 12,000-sq.-mile concession granted by Abu Dhabi, a British protectorate on the Trucial Coast. Parent companies of Abu Dhabi Marine Areas are British Petroleum Co., Ltd., holding a two-thirds interest, and Cie. Francaise des Petroles, one-third.

Operators have been preparing a base camp at Das for months. Helicopters fitted with flotation gear will shuttle between the barge and the island.

One other well is drilling in the Persian Gulf. The "Queen Mary," a mobile platform, is working off Saudi Arabia on the new Manifa field discovery.

The only crude production in the Persian Gulf is from Manifa fie'd and nearby Safaniya field. Both fields are discoveries made by Arabian American Oil Co.

At least two more outfits are on order. Aramco is buying a new, small-sized offshore rig. And Shell Co. of Qatar is buying a platform to replace a 1,900-tonner scrapped a year ago after suffering severe damage while under tow.

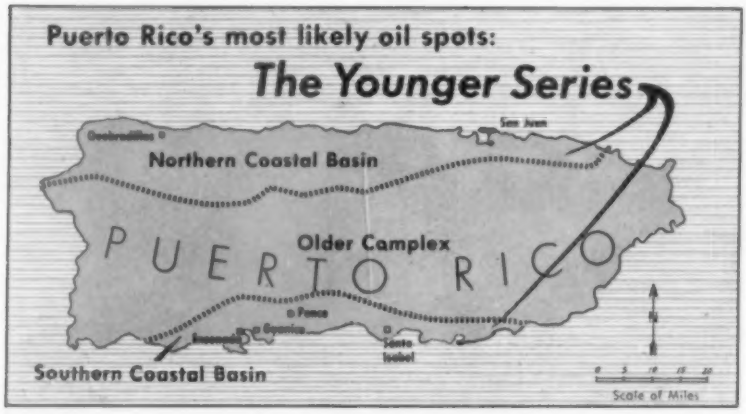


The "Adma Enterprise" currently is being fitted at Das with longer legs. A 24-ft. section and two 16-ft. sections are being added to give a total length of 161 ft. to each of the four 10-ft. diameter legs.

Operators are installing a heavy rig capable of going to 15,000 ft.

Oil Rules Are Changed

. . . to encourage exploration in Puerto Rico. There's no oil production so far, but two coastal basins look promising.



PUERTO RICO, a recent addition to the world's oil refiners, is waiting with open arms—and tax exemptions—for someone with a drill and the will to find oil on the little island.

Gov. Luis Munoz Marin has just signed revisions of the island's oil and gas regulations which he hopes will lure prospectors. The changes are meant to make Puerto Rico more attractive to the oil finder than before.

Here are the new regulations:

. . . **Ownership** of all hydrocarbons is retained by the people through the commonwealth government.

. . . **Exclusive** prospecting permits may be renewed for a total of 10 years. These were originally for 1 year with one 3-year renewal. The permits, covering specified areas, allow surface and geophysical work but no drilling. Each permit requires a fee of $10 and a bond of $10,000, but there is no rental or other charges.

. . . **Drilling leases** totaling 20,000 hectares (49,418 acres) may be granted to any one person in any one calendar year. These leases are made up of lease blocks with a maximum area of 1,344 hectares (3,321 acres) each. The blocks must be separated by an open strip of at least 6,000 ft.

If the holder of an exclusive prospecting permit takes a lease within the area of his permit, he must surrender to the government an adjacent part of the permit equal to the size of his lease.

The term of a lease is 40 years with renewal periods to give a total of 70 years of operation.

. . . **Lease applications** require a $50 fee and carry an annual rental of $20 for each 40 acres, or what the government calls a "drilling unit." This rental fee goes up to $40 a year for each 40-acre drilling unit after the first year. A drilling operation must start within 6 months after the lease is granted. Drilling requires a bond of $100,000.

. . . **Exploration costs** prior to a commercial discovery may be deducted from the annual rental. The regulations do not require any specified amount of exploration, but at least one rig must be kept active on every full lease. Any lease block (the 3,321-acre tracts making up a full lease) on which no drilling has been done at the end of 10 years must be surrendered.

. . . **Royalties** due the government, if and when commercial production is found, are on a sliding scale from 5 to 16⅔ per cent depending on individual well output. The oil may be marketed either in Puerto Rico or exported freely.

One permit issued . . . Up to now the geological exploration of Puerto Rico has been carried on almost exclusively by universities or government bureaus.

One exploration permit has been issued to Allas Tair Frazer, an individual who owns copper and iron mining interests in Jamaica. Frazer's permit covers most of Puerto Rico's north coast Tertiary basin.

He contracted Aero Service, Ottawa, for airborne magnetometer and scintillometer surveys, which have been completed. Geophysical Engineering & Survey, Ltd., Toronto, has just started ground work in the same area under contract to Frazer.

The Puerto Rico mining commission is considering several applications for similar permits covering parts of the south coastal area near Santa Isabel.

The geology . . . No oil has ever been produced from Puerto Rico. The island has no known or confirmed oil seeps, but geologists believe the north and south coastal basins contain sedimentary rocks thick enough to warrant drilling.

Puerto Rico is the smallest island in the Greater Antilles group. It has more than 3,400 sq. miles of land area and offshore shelf areas on the south, west, and east. Its general geology has been outlined by a number of surveys between 1917 and 1955 conducted by the New York Academy of Sciences, the U. S. Geological Survey, and private geophysical firms employed by the Puerto Rico Industrial Development Co., a government agency.

Puerto Rico has two general geological units which might serve as traps for oil and gas:

. . . **The Older Complex** is probably the least promising, according to most geological opinion. It is exposed in the central two-thirds of the island and is composed of normal marine sediments and marine pyroclastic sediments of Upper Cretaceous and lower Tertiary age. It is intruded by granitic rocks in some areas and then folded, faulted, and slightly metamorphosed.

In southeastern Puerto Rico near the south coast, 14,000 to 18,000 ft. of mixed sediments and volcanics have been measured. In the northwestern part of the island more than 6,000 ft. of fossiliferous pyroclastic sediments have been mapped.

. . . **The Younger Series** is regarded as more promising. It overlies the Older Complex along the north and south coasts and on the islands of Vieques to the east and Mona to the west, Puerto Rican possessions. It is primarily limestone Tertiary rocks ranging from middle Oligocene or Miocene.

The northern area of outcrop is the largest and extends for nearly 100 miles eastward from the island's west coast. It is 13 miles wide in the area between Hatillo and Quebradillas. Reflection seismograph surveys indicate the series in this area may reach 11,000 ft. thick near the Atlantic Coast.

Similar rocks crop out on the southern coast from Lago Coamo, north of Santa Isabel, to Ensenada. Between Ponce and Guanica Harbor this belt of exposed rocks is 2 to 3 miles wide with an indicated thickness of 6,000 ft.

PRESIDENT Ernesto De La Guardia of Panama, left, discusses new concession with R. B. Kahle, Eastern States president.

Panama Grants Concession

EASTERN STATES Petroleum & Chemical Corp., Houston, has acquired a Panama concession of approximately 1,500,000 acres.

The concession covers the width of the isthmus and is located in an area about two-thirds the distance from the Canal Zone to the Costa Rican border.

Panama awarded the concession to an Eastern States subsidiary, Eastern States Petroleum Corp. of Panama, S.A., which plans an immediate basic geological survey and other follow-up exploratory work. The concession is located in Bas Bocas del Toro, Chiriqui, and Veraguas provinces.

The award further emphasizes the feverish search for oil expected during 1958 in Panama. The concession is east of acreage held by United Fruit Co. in Chiriqui. United Fruit is reported planning a deep test this year.

Another 1958 deep test is expected on the Tradewinds Exploration Co. concession, northeast of the Eastern States acreage. Tradewinds is an affiliate of McRae Oil & Gas Corp.

Other companies participating in the Panamanian search include Delhi-Taylor Oil Corp., Champlin Oil & Refining Co., Kerr-McGee Oil Industries, Inc., and Southland Royalty Co.

Argentina's YPF Operating in the Red

WORD that the Argentine state oil agency will operate at a loss this year has taken some of the bloom off recent oil progress in that country.

The oil-conscious Argentine public generally took it for granted that Yacimientos Petroliferos Fiscales' expansion was on a pay-as-you-go basis.

But the new budget report submitted by the government indicate YPF this year will have an operating loss equal to a $30-million bond issue recently floated by the oil agency.

Reports from Buenos Aires are that financial and political people are bewildered. There is some demand for more details on operations on the part of the government.

The financial troubles came to light on top of year-end figures on imports, which are still growing. Domestic output met only 36 per cent of demand in 1957, as compared with 60 per cent in 1940.

Expansion . . . To stem the rising flow of imports, YPF last year raised crude production to 79,200 bbl. daily. The agency also entered a $180-million pipeline construction contract and has awarded a $3-million contract for development drilling on Tierra del Fuego, on the southern tip of South America. Laughlin - Porter Drilling Co. of Midland, Tex., will drill 40 wells at Tierra within the next 2 years.

The public recently snapped up the $30-million bond issue floated by YPF. Investors are guaranteed a minimum of 6 per cent on their investment, with a possible return of 20 per cent. The money is to be used to help boost production to a goal of 635,000 bbl. daily by 1970.

World briefs

The Guatemalan Government has granted seven new concessions, bringing current awards to more than 10-million acres.

Four companies won the new licenses. Union Oil Co. obtained 53,100 acres in El Peten province. Ashland Oil & Refining Co. acquired 46,000 acres. Hawthorne Investments, Inc., obtained 107,100 acres in El Peten, and 494,200 acres in other northern provinces. Argus Petroleum Corp. received a total of 246,600 acres in El Peten.

Petrolera Dominicana, C.A., backed by H. S. Cole, Jr., & Son, Houston, has spudded its first test on a 2,100,000-acre concession in Dominican Republic. The wildcat is projected to 10,000 ft. (OGJ, Nov. 11, p. 131).

Ste. des Petroles d'Afrique Equatoriale Francaise expects to produce from 8,000 to 10,000 bbl. daily this year in Gabon, French Equatorial Africa. Pointe Clairette and Ozouri fields have averaged 3,200 bbl. daily since they opened early this year.

British Petroleum Co., Ltd., will start work in January on a 10,000-bbl. catalytic reformer at its 70,000-bbl.-daily Kwinana refinery in Western Australia. The $8,000,000 unit will go on stream by the end of 1958.

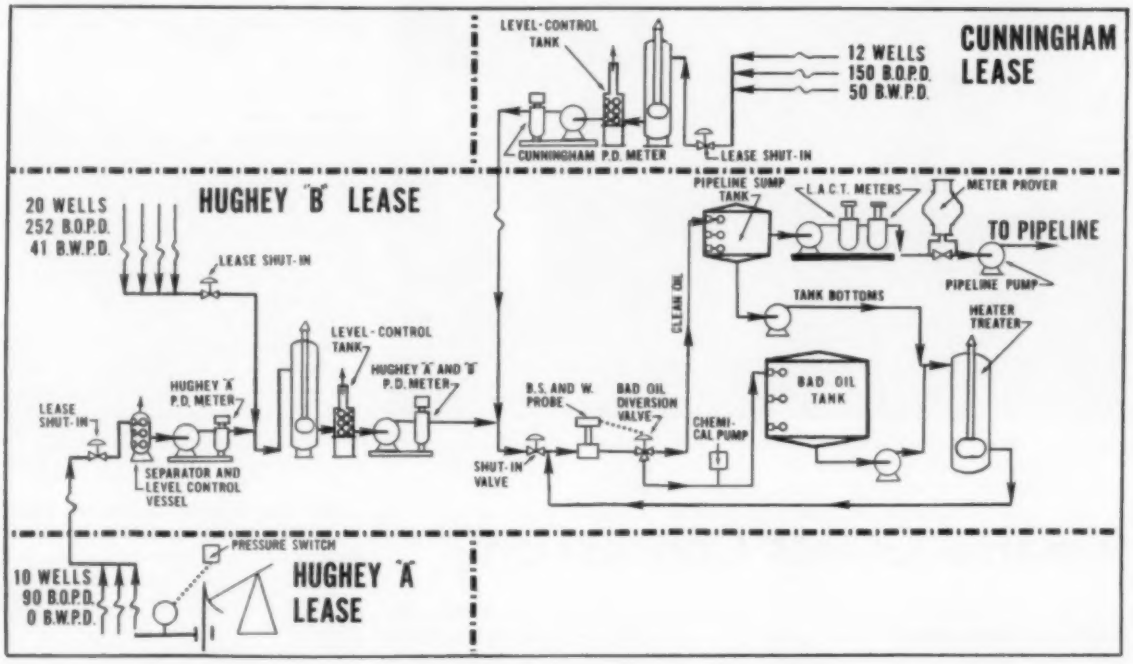
The Polish Government will rebuild the old Glinik Mariampolski refinery in the southeastern part of the country. When modernized as a 3,000-bbl. plant, the refinery will have half of Poland's small refining capacity.

British Petroleum Co., Ltd., will spud a deep test sometime soon 150 miles south of Dakar in French West Africa. The well will be located in the Casamance area. B.P. is working in South Senegal with French interests.

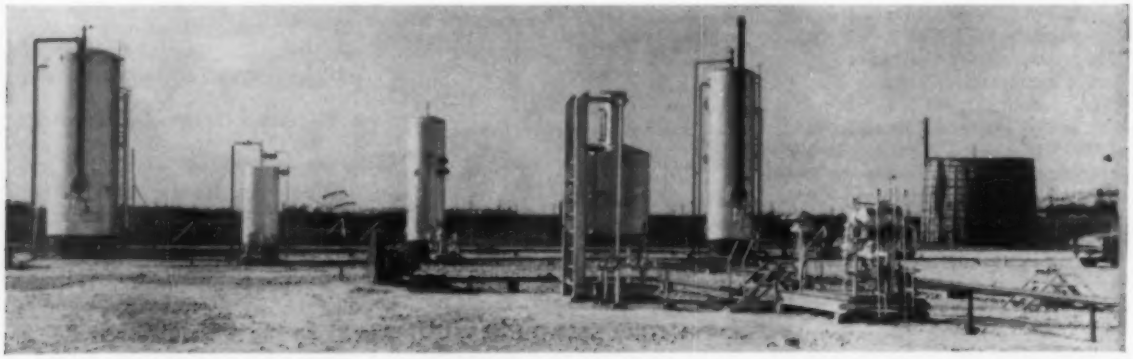
Shell Petroleum, Ltd., plans to add a $2,250,000 Udex unit at its Stanlow refinery in England by mid-1958. The unit, designed by Universal Oil Products, will take feed from a Platformer.

Chinese Petroleum Corp. reportedly has firmed up a long-term contract to supply gasoline to a marketing firm in Queensland, Australia. Shipments will average 3,900 bbl. daily for 10 years.

Trinidad Oil Co., Ltd., became Texaco Trinidad, Inc., January 1. The Texas Co., bought the Trinidad concern in 1956.



Flow diagram for three leases and common prover system, and Fig. 1



view of the custody-transfer equipment. These show . . . Fig. 2

How Cities Service is using

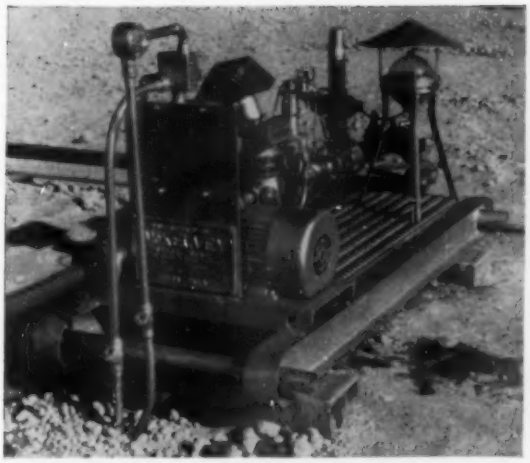
P.D. Meters for LACT

This lease-automatic-custody transfer unit is a Texas first. None other in the state has ever used positive-displacement meters in unattended operation and without duplicate measure of the crude in a tank. It's LACT with p.d. meters. Cities Service's skid-mounted design makes field installation quick and easy. Most important, the unit is accurate and reliable and can save money.

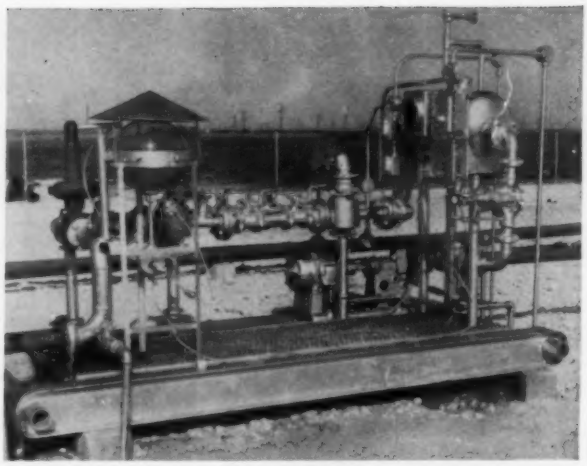
By Ed McGhee
District Editor

MOST of the lease-automatic-custody-transfer (LACT) units installed in Texas have used measuring tanks or dump meters.[1,2,3] Those that have used positive-displacement meters have kept production tanks to make a duplicate measure of the crude.[4]

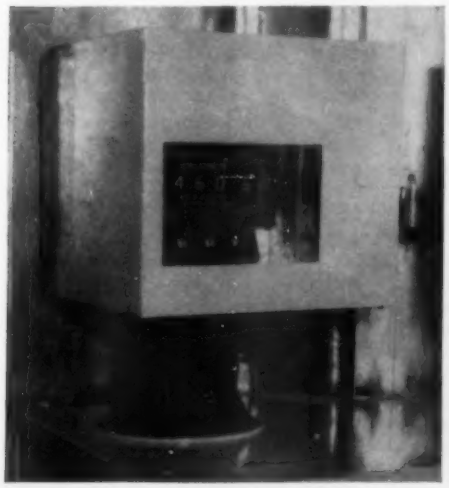
Only LACT installation yet made in Texas using p.d. meters with no duplicate measurement is pictured on these pages. The unit belongs to Cities Service Oil Co. and is located in Gray County. The company is metering crude from three leases into a central



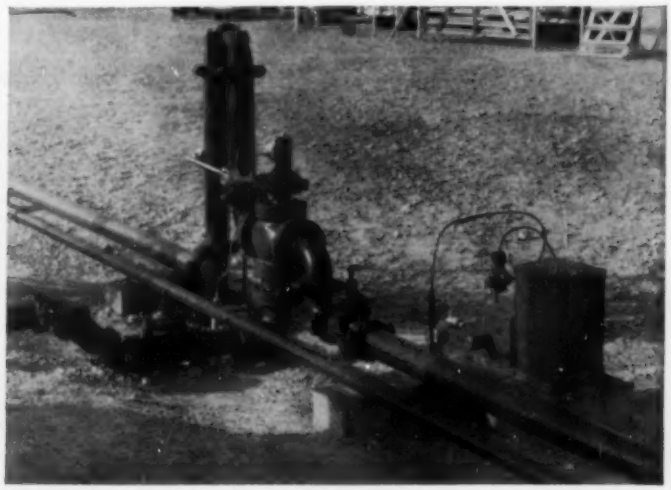
SKID-MOUNTED lease-meter package. Skid carries positive-displacement meter, motor and pump, and other equipment. Fig. 3.



SKID-MOUNTED LACT package. This skid carries two meters in series. Skid mounting makes installation much simpler and quicker. Fig. 4.



METER HEAD and ticket printer in the control house. One is used for sales, the other as a check. Fig. 5.



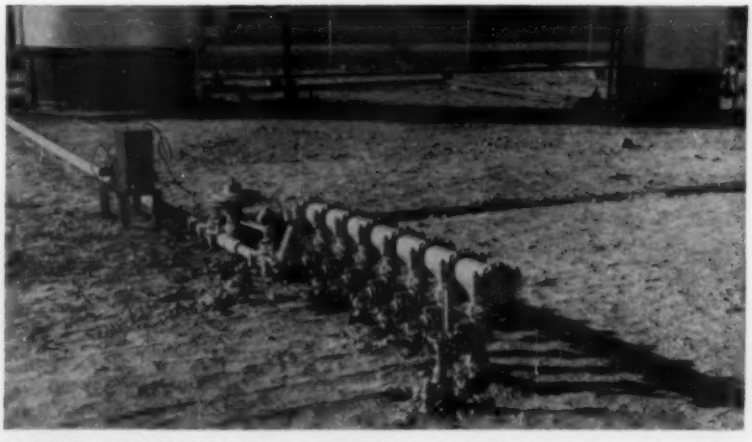
PROBE for the capacitance-type monitor is mounted in the vertical leg on oil-flow line. Three-way bad-oil-diversion valve is operated by monitor. Fig. 6.

LACT unit from which the crude is metered to Phillips Pipeline Co.

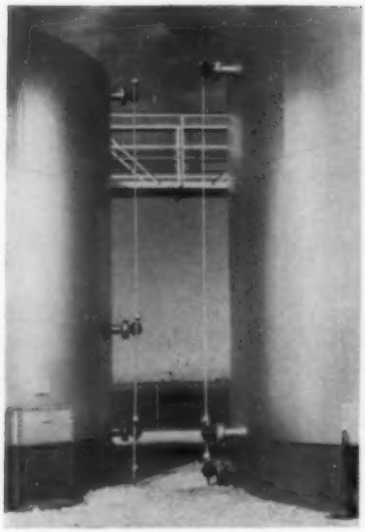
Cities Service decided on p.d. meters for these reasons:[5]

1. Pipeline companies have used p.d. meters with excellent results.
2. They are small, light, and easily adapted to skid mounting.
3. They can be corrected automatically for temperature.
4. Corrosion and deposition are less troublesome with p.d. meters than with tanks.
5. They are well suited to continuous flow.
6. They don't depend on floats and valves for their accuracy.

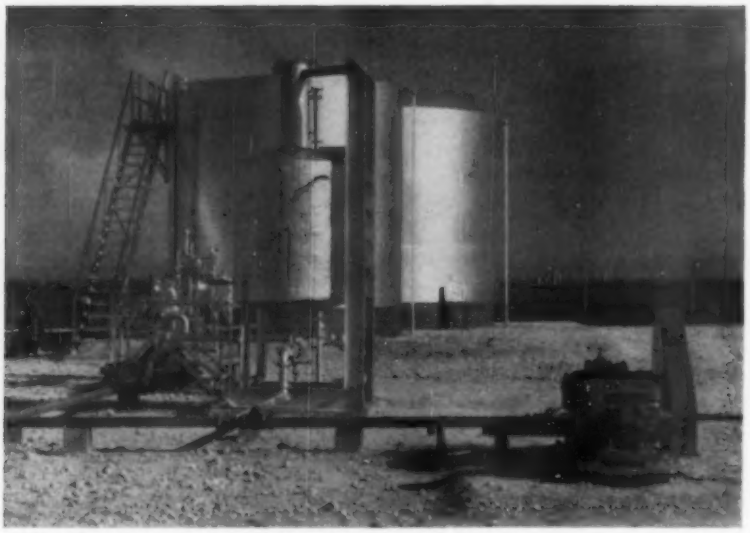
Replacing old batteries . . . About a year ago, Cities Service found it had to replace the tank batteries on three



FAIL-SAFE OPERATION has been provided by a lease shut-in valve on this incoming line to close in case of trouble. Fig. 7.



BAD-OIL TANK on left and pipeline-sump tank on right. Fig. 8.



PIPELINE PUMP and meter prover on LACT unit. So far, LACT meters have proved more accurate than hand gaging. Fig. 10.

adjacent leases in Panhandle field. This would be an excellent time to install LACT because new tanks would cost as much or more than a LACT unit. Moreover, operating costs with LACT promised to be lower than with the conventional hand-gaging method then in use.

Because the leases were adjacent, final plans called for one central LACT unit. Crude would be metered from lease, and the combined stream metered out to pipeline.

Positive-displacement meters have been measuring crude oil very successfully for many years. Reason they hadn't been used in Texas was a legal question on state regulations. So, after getting waivers from its royalty owners, Cities Service went to the Texas Railroad Commission for a permit to operate with p.d. meters. And, in April 1957, the commission granted a 6-month permit for trial operation.

Three weeks from the time the equipment was delivered, oil was going through the LACT unit and lease meters. Major equipment cost not including piping nor labor ran about $27,000. Fourteen 300-bbl. tanks were replaced.

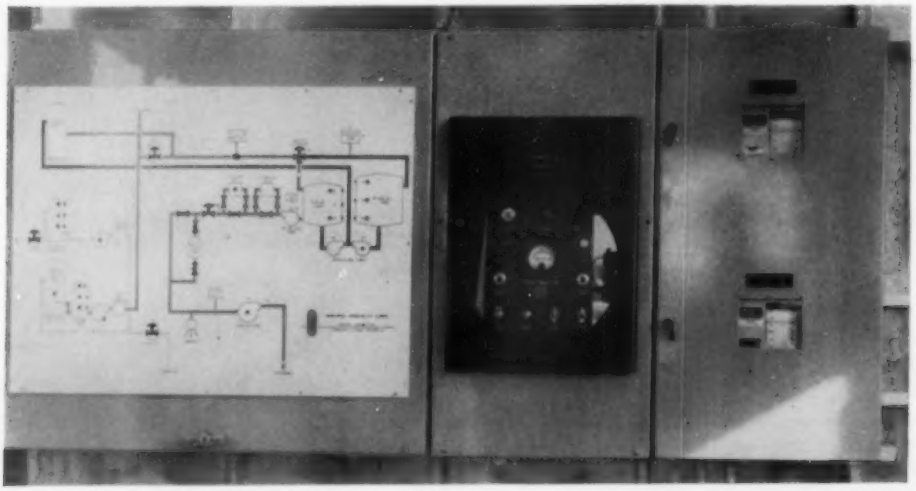
Accurate and reliable . . . In the first 2 months that the unit has operated, it has pumped 31,046 bbl. of crude to pipeline. The duplicate meters on the LACT unit have checked out very closely with each other at all times. And, when checked with a dump-type prover, the p.d. meters showed no serious errors. When spot checked with hand gages, the meters have shown themselves more accurate than the manual checks.

There has been little mechanical trouble and that little was in conventional mechanical equipment. The LACT system and its controls have shown no "bugs" of consequence. Moreover, by keeping the crude under a slight pressure and cutting down on weathering time, Cities Service figures it has saved about 170 bbl. per month from evaporating.

As a result, the company expects to ask the Railroad Commission for a permanent permit to operate the LACT unit.

Control on the leases . . . Fig. 1 shows the flow diagram for the three Cities Service leases. For convenience, the company placed the lease meter units of both Hughey A and Hughey B leases together on the B lease. Then, on the same location is the LACT unit. Fig. 2 shows this combination installation.

All wells on the three leases are



GRAPHIC PANEL in control house show condition of LACT battery. Fig. 9.

PUMPING UNITS are electrically driven to permit pressure switches on well flow lines. Fig. 11.

pumped with electric motors. As a result, pressure switches could be put on the flowlines to shut down the pumping unit in case of unusually high pressure in the line. And, lease shut-in valves cou'd be put at the flowline manifolds to stop flow in case of trouble downstream.

Oil from the manifolds goes to heater treaters, if necessary, to remove water. Them the oil goes into a surge tank. These tanks have three floats; the middle one starts a drawdown pump which runs until oil level falls to the bottom float. The top float closes in the lease shut-in valve in case oil level in the tank builds up too high.

Lease meter skids . . . For ease of instal'ation, Cities Service mounted the drawdown pump for the surge tanks on the same skid with the positive-displacement meter which measures oil out of the tank. Fig. 3 shows one of these skid packages which is on the Cunningham lease. There is an identical skid which measures oil from the Hughey A lease and a third which measures the combined oil stream from both Hughey A and Hughey B leases. Volume of the Hughey B oil is figured by substracting volume of the Hughey A oil from the combined volume.

Also on the skid with the pump and meter are a strainer, a sampler, and a back-pressure valve. Royalty owners are paid on the basis of the meter readings and on the gravity and b.s. and w. content as shown by the sampler. The back-pressure valve serves two purposes. First, it keeps 30 psi. on the meter so that no gas will break out and throw off the meter readings; second it keeps a constant head against the drawdown pump so that flow through the meter is almost constant.

Because it operates under a constant pressure and with a constant flow, the positive-displacement meter has the best conditions for measuring accurately. The strainer keeps foreign matter out of the meter's rotating parts and a temperature compensator adjusts it to read in net barrels at 60° F.

Into the LACT unit . . . Oil from the lease meters enters the LACT unit through a lease shut-in valve. This valve, normally open, closes in case of trouble in the LACT unit. If this valve does close, oil backs up in the level-control tanks at the lease meters. When oil backs up high enough in these tanks to trip their top float, the shut-in valves at the manifolds close. This, in turn, builds up pressure in the flowline, trips the pressure switches at the individual wells, and shuts them in.

As long as the lease shut-in valve is open, oil coming into the LACT unit flows through and passes the probe of a capacitance-type b.s. and w. monitor. If the oil is clean enough for sale, it continues on to the pipeline sump tank. If the oil contains too much b.s. and w., the monitor operates a bad-oil-diversion valve so that flow is into the bad-oil tank. Whenever oil is going into the bad-oil tank, a chemical pump automatically injects into the stream an emulsion-treating chemical.

Oil in the bad-oil tank recirculates automatically whenever level reaches the middle float. The recirculating pump runs until level falls to the lower float. The topmost float is for emergencies; if oil level reaches it, it closes the lease shut-in valve.

Out of the pipeline tank . . . Only clean oil ever gets to the pipeline sump tank. But, to prevent buildup of tank bottoms, Cities Service has made recirculation of bottoms automatic for the sump tank. When oil level reaches the middle float in this tank, both the drawdown pump and the recirculating pump start. When level falls to the lower float, both pumps stop.

If oil level ever gets to the top float, it operates the bad-oil diversion valve so no more oil can come into the sump tank.

Drawdown pump for the pipeline-sump tank is mounted on the same skid as the LACT meters. Fig. 4 shows this skid. This LACT skid is basically similar to the lease meter skids except that the LACT skid contains two meters, an air eliminator, and a pressure switch that starts and stops the pipeline pump.

Each of the LACT meters has a selsyn drive which can romotely drive a ticket printer (Fig. 5) in the control house. Only one of the meters at a time can drive the printer; a sealed selector switch determines which is used for sales and which as a check.

The same selsyn motor that drives the ticket printer also drives a pre-control that prevents the LACT unit from overrunning the leases' allowable. When total allowable is run for the month, a microswitch in the pre-control opens the circuit to the motor driving the pump on the LACT skid.

Fail-safe features . . . Cities Service has designed the Pampa system so that, as far as possible, it is fail safe. All float controls are plastic coated to cut down on paraffin deposition. Moreover, only a slight movement of the float will operate the connected microswitches. These switches can easily be adjusted from outside the tanks.

Lease shut-in valves are operated by gas pressure and controlled by solenoid pilots. The valve is normally closed so that, if gas or electric supply fails, the valve will close and shut in the lease. The bad-oil-diversion valve fails so that flow diverts into the bad-oil tank, not into the pipeline sump.

If a tube burns out or there is other failure in the b.s. and w. monitor, its controls automatically operate the bad-oil-diversion valve to put flow into the bad-oil tank.

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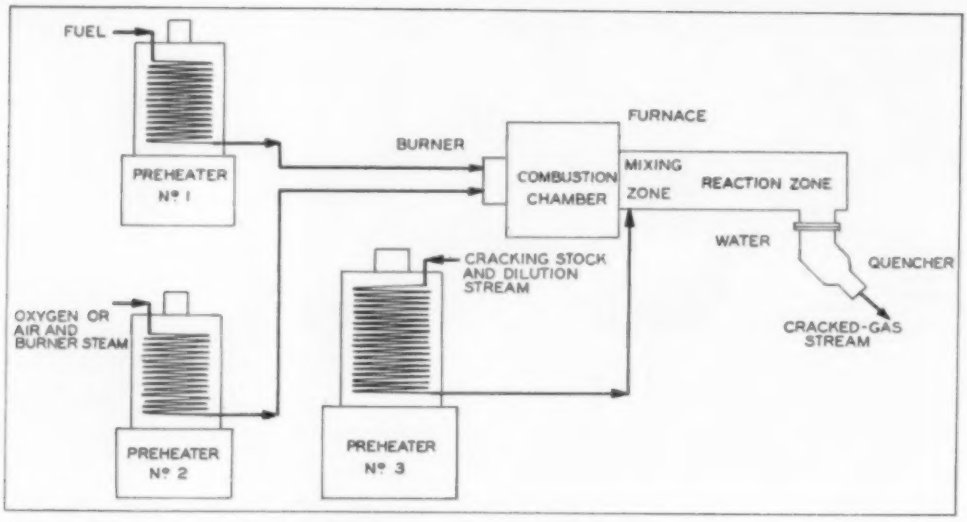


Here's the schematic flow diagram of a

Fig. 1

New Cracking Process for Acetylene and Ethylene

By G. A. Akin, T. F. Reid, and R. J. Schrader
Tennessee Eastman Co.

ACETYLENE and ethylene may be produced commercially from light, saturated hydrocarbons in a new pyrolysis process developed by Tennessee Eastman Co. The process has been proved in a semiworks experimental furnace with an annual capacity of a million pounds of acetylene plus ethylene, operated for a total of 12 months.

The key to acetylene production from saturated hydrocarbons is to supply rapidly and uniformly the relatively high heat necessary for reaction. In the Eastman process these objectives are achieved by rapidly and thoroughly mixing the hydrocarbon with hot combustion products.

The off gases from the reaction are processed to recover acetylene and ethylene as pure products. This recovery is accomplished at Eastman in a plant employing the Hypersorption process and selective absorption.

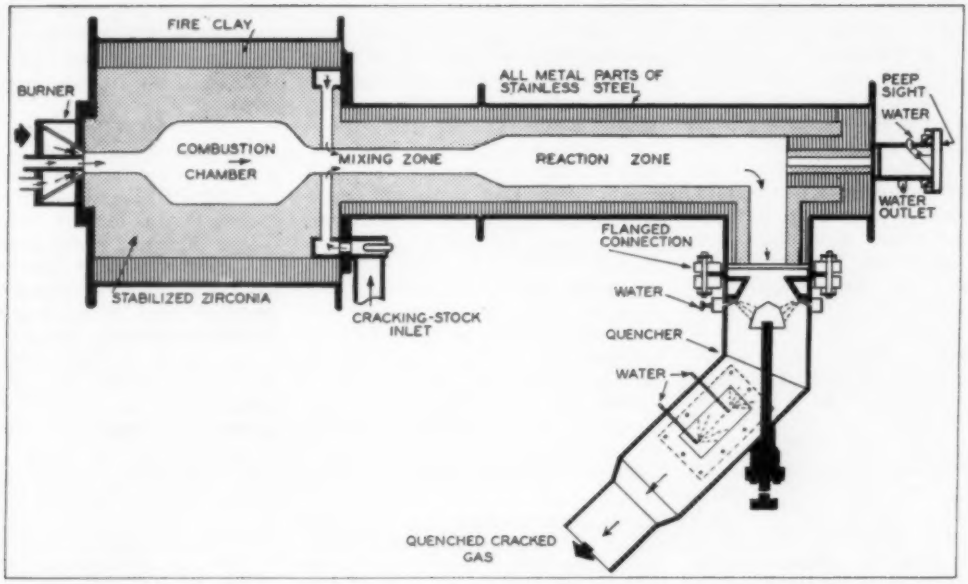
The cracking furnace, the key to any high-temperature pyrolysis process, was constructed with zirconia refractories, and was in excellent condition after 100 days of continuous operation. This shows that commercial furnaces can be operated success-

Material from paper presented at AIChE annual meeting, Chicago.

TABLE 1—BASIC DATA OBTAINED CRACKING PROPANE WHILE BURNING NATURAL GAS WITH AIR

Material balance No.	4	9	11	33	39
Product composition, weight per cent:					
C_2H_2	33.7	46.7	53.8	62.1	82.6
C_2H_4	66.3	53.3	46.2	39.9	17.4
Feed rates, s.c.f.m.:					
Air	137.5	123.5	123.5	123.5	123.5
Fuel (natural gas)	15.2	13.7	13.7	13.7	13.7
Cracking stock (C_3H_8)	29.2	18.0	16.0	15.6	9.6
Dilution steam (added to propane)	0.0	13.0	11.0	0.0	20.0
Burner steam (added to air)	0.0	20.0	20.0	16.5	9.0
Calcd. flame temp., °C.	2,120	2,000	2,000	2,000	2,050
Preheat temp., °C.*	600	600	600	600	600
Off-gas rate (dry), s.c.f.m.	208	168	170	165	166
Cracked-gas analysis, volume per cent:					
CO_2	4.05	5.51	5.30	.....	.....
C_2H_2	4.45	4.75	4.80	5.17	4.47
C_2H_4	8.13	5.06	3.80	2.94	0.87
C_3H_6	0.42	0.12	0.00	.....	.....
O_2	0.10	0.19	0.20	.....	.....
H_2	16.60	16.62	17.05	.....	.....
CO	5.08	4.54	5.80	.....	.....
CH_4	8.60	6.82	6.05	.....	.....
C_2H_6	0.03	0.00	0.00	.....	.....
N_2	52.54	56.39	57.00	.....	.....
Weight per cent conversion of cracking stock to:					
C_2H_2	18.75	26.25	30.1	32.3	45.6
C_2H_4	36.95	30.05	25.7	19.7	9.6
C_3H_8	3.14	1.04	0.0	0.0	0.0
Tar and carbon in the off gas, 1 to 10 μ particle size, est. grains per cu. ft.	1.0-2.0		2.0-3.0		4.0-5.0

*In material balance No. 4 all feeds were preheated; in the others the fuel was not preheated.



ANNULAR MIXING TYPE burner is shown at extreme left of this cross-sectional view of the semiworks furnace. Fig. 2.

fully if proper yearly maintenance is provided.

Either air or oxygen can be used to support the generation of the combustion gases. Conversions of cracking stock to acetylene and ethylene are the same in each case. Propane and natural gasoline were used as cracking stocks. Conversions to acetylene and ethylene of 56 wt. per cent from propane and 58 wt. per cent from natural gasoline were obtained.

The process can be employed to manufacture a product having a wide range of ratios of acetylene to ethylene.

How it works . . . A schematic flow diagram of the semiworks unit is shown in Fig. 1. Natural gas is preheated in Preheater No. 1 and fed to the burner mounted on the furnace combustion chamber. Either oxygen or air mixed with a metered quantity of low-pressure steam is preheated in Preheater No. 2 and also fed to the burner. About 95 per cent of stoichiometric oxygen is used. These streams mix and burn in the combustion chamber of the cracking furnace.

The combustion products discharge from the combustion chamber through a restricted opening at a relatively high velocity. Hydrocarbon cracking stock plus some low-pressure steam are preheated in Preheater No. 3 and are fed into the high-ve'ocity stream of combustion products immediately after it leaves the combustion chamber. The cracking stock and the combustion products mix in a venturi section and pass into the reaction zone where the dissociation of the cracking stock to form unsaturated products is completed.

The gas mixture is then water-quenched to stabilize the reaction products. This stream is processed to recover the desired products.

The furnace . . . A cross-sectional view of the semiworks furnace is shown in Fig. 2. The annular mixing-type burner is shown at the extreme left, mounted on the end of the combustion chamber. Adjacent to the combustion chamber is the mixing zone and then the reaction-completion zone.

The inner course of the combustion chamber, the mixing zone, and the reaction zone were fabricated from stabilized zirconia refractories. The outer course is composed of refractory fireclay. The exterior wall of the furnace is of stainless steel, of all-

TABLE 2—BASIC DATA OBTAINED CRACKING NATURAL GASOLINE WHILE BURNING NATURAL GAS WITH AIR

Material balance No.	13 and 14	15	19	17	22
Product composition, weight per cent:					
C_2H_2	31.7	45.8	58.3	60.3	80.3
C_2H_4	68.3	54.2	41.7	39.7	19.7
Feed rates:					
Air, s.c.f.m.	123.5	123.5	123.5	123.5	123.5
Fuel (natural gas), s.c.f.m.	13.7	13.7	13.7	13.7	13.7
Burner steam (added to air), s.c.f.m.	16.0	16.0	16.5	16.5	16.5
Dilution steam (added to cracking stock), s.c.f.m.	33.0	33.0	33.0	33.0	33.0
Cracking stock (natural gasoline, sp. gr. 0.638), ml. per min.	1,910	1,400	1,100	1,040	880
Calcd. flame temp., °C.	2,000	2,000	2,000	2,000	2,000
Preheat temp., °C.*	600	600	600	600	600
Off-gas rate (dry), s.c.f.m.	168	165	158	154	156
Cracked-gas analysis, volume per cent:					
CO_2	5.27	5.10	....	....	....
C_2H_2	4.15	4.39	4.23	4.0	4.68
C_2H_4	8.30	4.80	2.70	2.47	1.06
C_3H_6	0.47	0.13	....	....	....
O_2	0.11	0.10	....	....	....
H_2	12.65	14.45	....	....	....
CO	5.16	7.10	....	....	....
CH_4	6.93	5.78	....	....	....
C_2H_6	0.04	0.00	....	....	....
N_2	56.92	58.15	....	....	....
Weight per cent conversion of cracking stock to:					
C_2H_2	18.7	26.6	31.4	30.5	42.6
C_2H_4	40.3	31.3	21.5	20.2	10.4
C_3H_6	3.4	1.8	0.0	0.0	0.0

*All feed streams except fuel were preheated.

welded construction to eliminate leaks.

A quencher, attached to the discharge port of the furnace, sprays the effluent gases with water to cool them below 100° C.

The variables which affect the composition of the product are the reaction temperature and reaction time. By varying the reaction temperature, the composition of the product can be changed within wide limits. The reaction temperature is controlled by regulating the temperature and amount of both the combustion gases and the cracking stock. High ratios of acetylene to ethylene are obtained by reducing the amount of cracking stock in relation to the amount of combustion gases.

The reaction time can be changed by adjusting the volume of total gas put through the unit. However, due to the characteristics of the reaction, a given furnace design can be used to produce a range of product compositions with only a small change in capacity.

Experimental Results

The semiworks plant operated very satisfactorily. There were no by-products which presented serious difficulty in the purification and recovery of products.

Air vs. oxygen . . . Conversion of cracking stock to unsaturates is almost identical for both methods. Major differences in the product are the concentrations of deesirable components of the off gases. Concentration of such products when using air is slightly less than half that using oxygen-supported combustion.

There is more tar in the off gas when using air. However, this does not become a significant factor except at high ratios of acetylene to ethylene in the product.

The choice between the two methods must be made on economic considerations, balancing the investment for an oxygen plant against the increased investment in gas-compression and separation facilities. These two factors so nearly balance each other that a decision might be based on the use of byproduct gases.

Cracking stock . . . The majority of the experimental work was done using propane and natural gasoline as cracking stocks. However, the process should be adaptable for other hydrocarbons of the type which are heavier than methane.

Data of Tables 1 and 2 were obtained while cracking propane and natural gasoline, respectively, by air-supported combustion. Slightly higher yields were obtained with natural gasoline at the lower acetylene-to-ethylene ratios. At the higher ratios the yields were slightly higher from propane. More tar was formed when using natural gasoline, but this was easily controlled by adding more steam with the cracking stock.

Fuel and air requirements for cracking with natural gasoline are approximately 10 per cent higher per pound of product. This is attributed to the required extra dilution steam and to the higher heat of reaction.

Limited experiments with dilution steam being replaced by natural gas show an increase in conversion of acetylene and ethylene from 55.8 wt. per cent to 63.5 wt. per cent at comparable reaction conditions. This method of operation looks promising, but the economics at a given plant location would determine the choice.

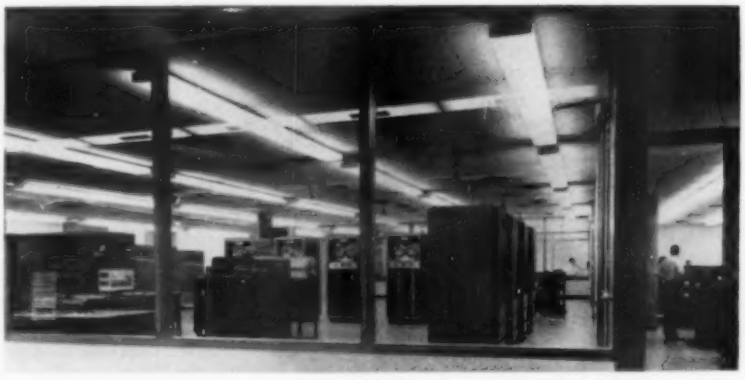
Effect of temperature . . . Higher reaction temperatures favor the preferential formation of acetylene. Control of the ratios of acetylene to ethylene reported in Tables 1 and 2 was effected most strongly by increasing reaction temperature.

This was done by cutting the cracking-stock feed rate progressively to obtain higher and higher ratios. Thus, progressively less endothermic heat of reaction was required, and effective reaction temperatures progressively increased.

Byproducts . . . Higher acetylenes, aromatics, and tar are produced in the reaction. Slightly more of these materials are formed when using oxygen-supported combustion. In one run using propane as cracking stock, the higher materials amounted to 2.6 mole per cent of the total cracked gas stream from the furnace.

As ratio of acetylene to ethylene in the off-gas stream increased, total amount of higher materials decreased slightly. Tar and carbon increased as more acetylene was made.

In subsequent processing of the off gas, an aromatic oil which represented 2 to 3 wt. per cent of the cracking stock was recovered. This oil contained approximately 65 vol. per cent of benzene, 19 per cent toluene, and 16 per cent xylenes and higher aromatics. Approximately 25 per cent more aromatic oil was recovered when natural gasoline was used as cracking stock.



For Sale: Computer Machine Time

THE COMPUTER CENTER operated by General Electric Co.'s computer department near Phoenix differs from other such facilities in that it has computer time for sale.

Small oil companies not able to afford full-time rental of high-speed computers are taking advantage of the offer. Several are using the center to carry out scientific and technical calculations. Some major companies likewise are buying time to handle their computer overflow.

Located on the campus of Arizona State College at nearby Tempe, the center is equipped with an IBM 704 and the very latest in peripheral equipment. In addition to computer-machine time, services offered include programing and operations research and synthesis. The center is staffed by some 70 computer specialists in various fields.

A new service is that of program simulation for medium-speed computers.

4 CATALYST EROSION IN CAT CRACKERS

case histories of its control

This is the final installment of a series by Larry Resen, Gulf Coast Processing Editor. Previous installments have appeared in the issues of December 9, December 23, and January 6.

Problem: Thermocouple well erosion.

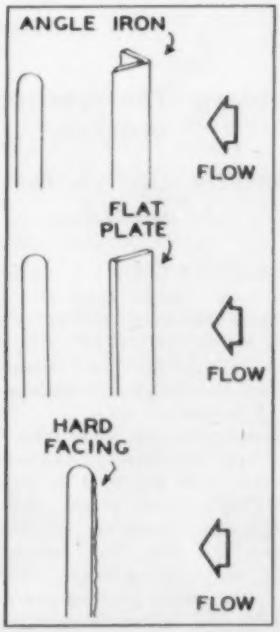
Solution: Protect with flat plate or by hard facing.

OFTEN, thermocouple wells installed within catalyst systems are directly exposed to the catalyst flow. Where these thermowells are unprotected, it takes little time for them to be completely eroded by catalyst action.

At one plant, a 2 by 2 angle iron was installed upstream of each thermowell to serve as a buffer between it and the oncoming catalyst flow. The angle iron was installed with the angle facing the flow upstream and the open side facing the thermowell and acting as an umbrella.

These angle irons would erode at a rapid rate, leaving the thermowell unprotected as before. The angle of impingement of catalyst against the sides of the angle iron was thought to have a great deal to do with this rapid rate. Since the angle iron surfaces are at a 45° angle to catalyst flow, the catalyst particles strike the surface in such a way as to promote erosion. Particles hitting a surface at 90°, meanwhile, have the least effect since they are unable to start a good scouring action.

As a result of this, flat rectangular buffers were installed upstream of the thermowells. These plates are perpendicular to the catalyst stream and have a much longer service life than the angle irons. A companion modification was the use of a hard-surfacing material on the thermowell itself. By applying Colmonoy 1 to the thermowell, it has a satisfactory service life without need of a buffer plate of any kind. This latter method has the advantage of more accurate temperature indications. A buffer sets up a dead space around the thermowell, which causes recorded temperature changes to lag the actual conditions somewhat. With only a hard facing as a protection, no dead space exists, and temperature as indicated is more representative of changing conditions.



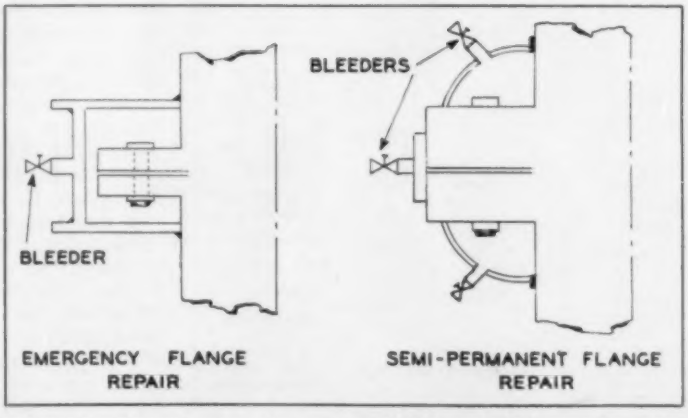
PROTECTIVE MEASURES for thermocouple wells.

Problem: Flange leaks.

Solution: Install "box" over entire flange.

WHEN A LEAK occurs around a flange, a special problem exists. The immediate thought is to put a bank of metal around the space separating the two flange faces. However, such a course will be only a temporary solution, since the erosion will eventually start working on the bolts and cause leakage to occur around them. Two procedures prevent this and stop the leak.

First is an emergency procedure, designed to get the leak stopped as fast as possible. Two rings are cut out of plate steel, with the same internal diameter as the pipeline. These rings are split in halves so they may be made up around the line on either



LEAKING FLANGES won't need emergency shutdown if repairs are made quickly.

side of and parallel to the flange. A strip of plate is then cut out and rolled to fit around the flange itself. This strip is made wider than the flange. The two rings are welded to the rolled strip and to the pipe so as to encompass the entire flange.

A bleeder is used on the box so that welding may take place without interference. The bleed valve is closed off once the box is completed. Leakage of catalyst continues into the box until it is filled up and the catalyst itself serves to stop the actual leak. Since dimensions are not critical with this arrangement, the box can be made up and installed quickly.

The second method takes longer but is a permanent installation. The box itself is not especially strong from a structural standpoint. Hence a follow-up job is suggested when more time is available. In this case, a steel band is welded completely around the flange to cover the space separating the two faces. In addition to this, a curved piece of metal is welded completely around the pipe behind each flange and to the rear of each flange face. This elongated S-shaped fitting extends out beyond the bolts. In effect, the flanges are backed up by two semitubular sections. Each of these sections is equipped with a bleeder line. The curved fitting requires a precise fit, but is much stronger than the "box" mentioned above.

Caution: Normally the bleeder valves are left closed. However, after a shutdown, and before a startup, these valves must be temporarily opened. This will permit any entrained liquids to be ejected. Otherwise, increasing temperatures might result in generation of steam and high pressures within the boxed flanges.

Problem: Slide-valve erosion.

Solution: Modify valve and internals.

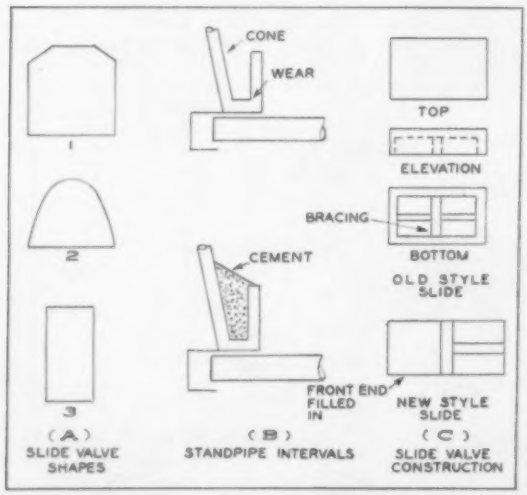
IN THE COURSE of operating a cat cracker over several years, various experiments were carried out to develop a better type of slide-valve arrangement.

In the first installation, the valve body was in the shape of a square. (A) 1 in figure. This type of valve exposed a large area to the catalyst flow through the standpipe. Hence, wear occurred at a rather high rate.

A modification was made to reduce the exposed area of the slide valve. A new valve was installed with the slide curved at one end, (A) 2. Initially, this provided a lower erosion rate since there was a smaller area along which erosion could occur. However, once erosion began, the irregular shape caused a wild catalyst flow which increased the erosion rate and made it progressively worse. The guides also experienced a great deal of wear due to the erratic flow as erosion continued.

The final shape to evolve out of the experiments is a long rectangular slide valve, (A) 3. The valve opening can be held to the desired size with only a narrow leading edge of the valve exposed to the flow of catalyst.

In other modifications, the valve body was also altered. In original form, the slide was built up out of sections of 1-in. material, with reinforcing ribs within the slide body (B). Whenever erosion did eat through the 1-in. material, a hollow compartment would be exposed. Erosion rate would then increase tremendously, due to void within the valve body. To offset this, the front half of the slide was filled to make it a solid entity. Wear is even under these conditions. Hard surfacing of the slide has also proved beneficial.



MODIFICATIONS in slide valve construction.

Standpipe internals were modified in the continuing slide valve improvement program, (C). The standpipe is tapered slightly in the vicinity of the slide valve. Originally, a ring extended inward from the taper to provide a narrow opening just above the slide valve. A short riser extended upward from the internal circumference of the ring. In operation, catalyst would strike against the ring and erode through it in the space between the riser and the tapered side of the standpipe. Once this occurred, the catalyst could then directly attack the slide valve, near its stem. The valve then being subjected to two avenues of attack would fail all the more rapidly.

A simple solution here was to fill the gap between the riser and to taper back to the standpipe to afford a streamlined flow path.

A final improvement involved operation of the valves. Originally, two valves installed in the standpipe were operated singly. One would be used until it wore out and then the second was put into service until it, too, wore out. Both would then be replaced at a turnaround.

A change was made to use both valves simultaneously, with part of the pressure drop being taken across each. Erosion is related to the cube of the velocity and the velocity is a function of the square root of the pressure drop. Hence, a beneficial effect is achieved in a reduction of the pressure drop in the reduction of velocity and a resultant drop in erosion.

Problem: Thermocouple erosion.

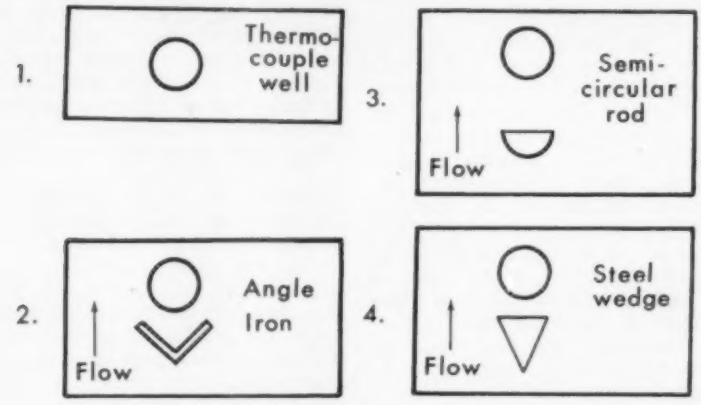
Solution: Upstream guard.

THERMOCOUPLES are subject to severe erosion when placed in catalyst-oil lines. Thermocouple wells themselves are also subject to attack. Both extend into the lines perpendicular to the flow and this contributes to a high rate of erosion.

Several methods were tried in a unit to prevent or reduce this erosion. Thermocouples are used in both the dilute, high-velocity phase and in the dense phase. Removal-type thermocouples are used, and can be inserted and removed through a block valve and special packing gland.

A decision was made to use a barrier between the flow and the thermocouple. It was felt that the barrier

EROSION CONTROL IN CAT CRACKERS



PROTECTIVE DEVICES to retard thermocouple erosion.

would then take the brunt of the erosive attack and leave the thermocouple relatively unharmed. An angle iron was mounted in the line, close to the thermocouple, with its point facing towards the stream's flow. Catalyst-oil flow was then diverted around the thermocouple to a large extent. This angle-iron installation provided about 9 months' service.

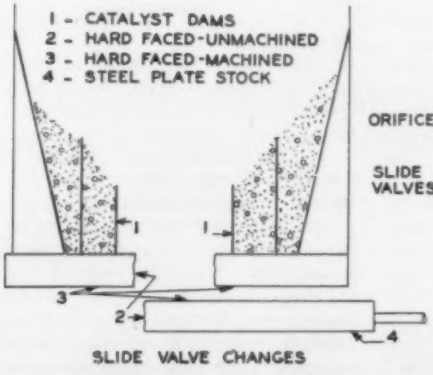
A second installation was tried. This time a rod was cut in half, lengthwise, and placed with its rounded side pointing toward the stream's flow. The idea here was to provide a thicker metal barrier which would take longer to erode. This did not prove satisfactory.

A third and final change was made. Since the triangular shape of the angle iron proved rather successful, it was felt a solid triangular piece of metal would be more satisfactory. A steel wedge was then installed in the line. This was designed on the basis of the venturi principle. The ratio of its altitude to its base is 8½ to 2½. This design lends itself to natural flows and the flow of catalyst-oil around the wedge is thus accomplished with a minimum of erosive action. This last arrangement has proved quite satisfactory.

Problem: Slide-valve erosion.

Solution: Modify inlet, hard face, use orifice plates.

SLIDE-VALVE EROSION is normally expected in fluid units due to the high density and velocity of the catalyst as it passes through standpipes and accompanying slide valves. This erosion can be retarded by some relatively simple changes.



SLIDE VALVE modifications to retard erosion.

Hard facing of the control valve and the valve seat is recommended as an excellent way to retard erosion. Colmonoy 1 is suggested as a good facing material. It should be applied to the leading edge of the valve, which receives the brunt of the erosion, as well as on the internal surface of the seat ring. The built-up metal facing should be left as is, except on mating surfaces. There it should be machined to provide a smooth mating surface and with the tolerances required for proper functioning of the valve.

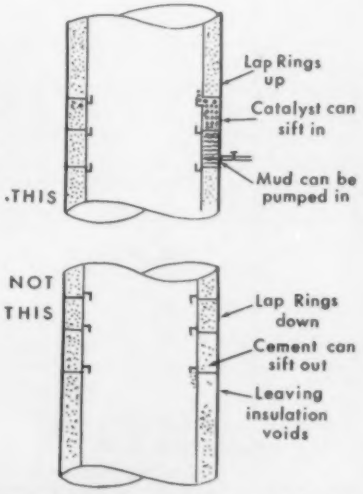
Frequently, the tapered inlet to the seat ring will be subject to erosion as the catalyst stream narrows down to pass through the valve. When this occurs, erosion will take place behind the ring. This can be offset by installing dams around the seat ring. These dams are simply doughnut rings made from plate steel. They are installed with staggered heights, so that incoming catalyst will pile up higher behind the dam nearest the standpipe and pile up at a lower height nearer the seat ring. This will provide a tapered effect. The piled-up catalyst, meanwhile, is most effective in keeping moving catalyst from reaching the standpipe in the vicinity of the seat ring.

Where one of the two slide valves normally installed is used strictly for control and the other strictly for emergency shutdown, it's recommended that orifice plates be used to take some of the pressure drop across the valves. A high pressure drop contributes to excessive wear. Orifice plates installed upstream, downstream, or in both places can help in alleviating severe erosion in these cases.

Problem: Loss of lap-ring insulation.

Solution: Install rings with opening up.

LAP RINGS are used internally on insulation-lined pipe. These L-shaped rings extend around the periphery of the pipe with gaps left between adjacent rings to allow for expansion.



PROPER INSTALLATION of lap rings prevents insulation voids.

EROSION CONTROL IN CAT CRACKERS

Insulating material is applied within these rings to form a solid coat around the interior of the pipe.

In some installations, the rings have been applied so that the expansion opening was downward. As insulating material would break away from the walls of the pipe, it would sift downward through these openings, leaving the pipe bare in that immediate area, thereby causing hot spots to develop.

If the rings are installed with the openings upward a threefold benefit can be realized. First, there is less likelihood that the insulating material —even if it's broken away from the wall of the pipe—will be removed from the enclosure formed by the lap ring. Secondly, if turbulent conditions within the pipe in the immediate vicinity gradually displace broken-away insulating material, the void will probably be filled by catalyst sifting down into the enclosure. The catalyst in itself will act as an insulator to some degree. Finally, if hot spots still develop in this second case, insulating mud can be pumped into the lap ring enclosure, if the openings are up.

In this latter case, several taps may be made around the pipe and a thin mixture of insulating mud pumped into the voids. The heat within the pipe will cause the mud to set up and it will then provide a satisfactory liner.

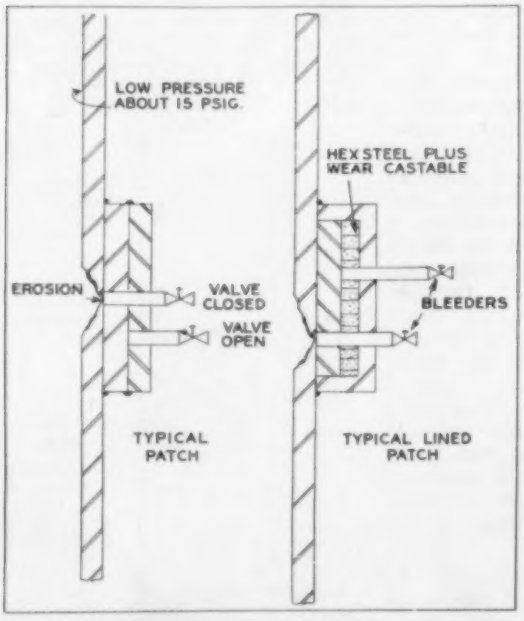
Problem: Leaks caused by erosion.

Solution: Patch over leaks to extend run life.

WHEN CATALYST erosion causes a leak in a vessel or a transfer line, a unit can be kept on stream provided a suitable patch is applied. The patch should be made as rapidly as possible.

A simple but effective patch can be made from a piece of plate equipped with a bleeder line. This bleeder is made by cutting a hole in the plate and welding a nipple in it. A valve is screwed onto the end of the nipple. Generally, the patch is made at least a foot square to take care of weak spots close to the leak. The patch should be applied with the bleeder as close to the leak as possible. This bleeder, with valve open, makes it possible to weld completely around the edges of the patch. Without this bleeder, the final weld would be difficult to complete since gas and catalyst would be escaping constantly near the weld. Once the weld is completed, the bleeder can be closed and the leak completely sealed.

The operating conditions existing will determine whether any more steps are taken. If the unit is due to come down shortly, no other patchwork will be undertaken. However, if the unit is due for a long run ahead, additional patchwork should be considered. A second patch, equipped with the same type of bleeder, should be added over the one just installed. In this case, the patch is made to fit around the existing bleeder. With this second patch in place, there are then two layers of metal over the original leak. The valve on this second bleeder is left open. Should the erosion be so severe in this area as to cause the initial patch to leak, material will flow out this second bleeder left open. This bleeder can then be closed off and another patch made up to go around this second patch. In this instance, there is no real need for an emergency rush job since one full thickness of metal—the second patch —is still in place. Where it has been highly undesirable to terminate a unit run, as many as six patches have been made in this manner.



TWO TYPICAL PATCHES which can be used to extend run life if leaks develop.

Fitting a patch around several of the bleeder lines in multiple patch instances can be a problem. If the bleeder line was somewhat short to begin with, this can be an annoyance, since the valve will be in the way. Sometimes it is possible to get away from multiple bleeders protruding through succeeding patches. If the leak is not too great, it's possible to cut the nipple off, ram a plug into the hole, and seal-weld around it. The succeeding patch is then welded over this patch. Hence, only one bleeder line will extend upward from the multiple patches.

If it's desired, the additional patches can be made up with wear castable linings. The patch can be applied and cured as usual and the patch welded into position over the foregoing patch. A bleeder line has to be included as before. However, the final makeup of the patch will be boxlike to fit around the castable. Since it takes a while to cure the castable, this patch cannot be used on an emergency basis.

Patchwork can also be applied over hot spots if felt necessary. Again, the open valve on the bleeder line will indicate when the actual leak occurs and another patch can then be applied.

Problem: Repairing leaks on stream.

Solution: Weld swage with valve over leak.

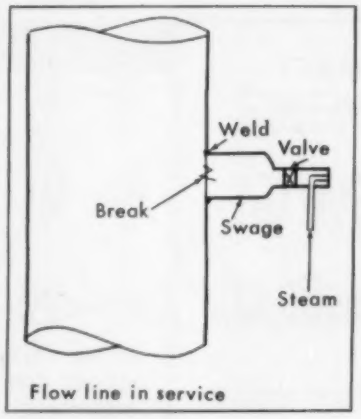
A TEMPORARY patch can be safely and conveniently applied where catalyst erosion or other effects cause leaks to develop in vessels or lines.

An appropriately sized swage can be welded over the leak. This swage should be equipped with a valve plus a special fitting downstream of the valve to permit a steam line to be injected. The steam is injected into the fitting through an eblow so that its flow is downstream or outward from the swage. The net effect will be to pull a slight vacuum on the swage.

With the steam turned on and the

swage held up against the vessel being repaired, oil vapors will be sucked out through the swage. It will then be possible to weld around the swage without oil leaking out around the welding area. Air being sucked in around the edges of the swage will insure cleanliness around the welds.

Any fires which occur with this setup will be within the confines of the swage. The steam will act as a snuffer and additionally serve to confine ignition to this isolated space. Once the welding has been completed, the valve can be closed and the steam line and fittings removed and the job will be completed. A permanent patch can be applied at an appropriate time during a shutdown.



REPAIRING leaks on stream.

Problem: Erosion around manhole.

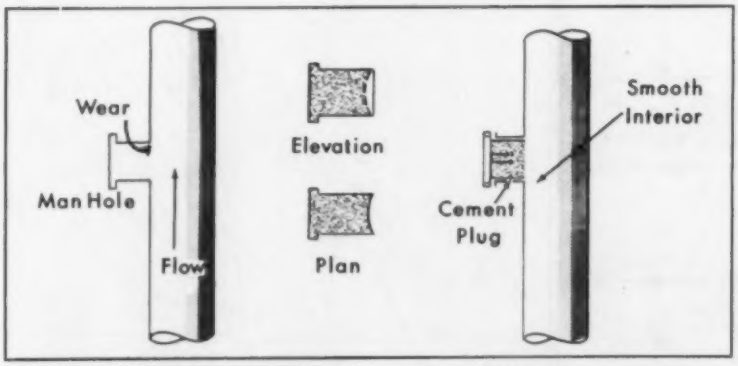
Solution: Insert dummy concrete plug in manhole.

EROSION will frequently be excessive around manholes in transfer lines. Usually this takes place on the downstream side of the access hole within the flow line. This may be attributed to the turbulence as the flow stream impinges against the juncture of the flow line and access hole.

A simple solution is to pour a dummy cement plug which will then fill the manhole. This plug should be contoured at the inside end to conform to the interior of the pipe. This smooth interior will provide streamlined flow past the manhole and eliminate the turbulence and resultant erosion.

Where insulating refractory linings are used, the plug should be made of the same material. It can be troweled to fit the curvature of the pipe.

The plug may be removed easily whenever necessary to use the manhole.



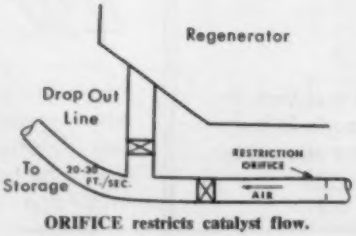
CEMENT PLUGS reduce corrosion around manholes.

Problem: Erosion of catalyst dropout system lines.

Solution: Restrict flow in system.

ON A CATALYST dropout system, a 4-6-in. line is used to permit catalyst to gravitate from the regenerator into a carrier line. Air is injected into this line and the catalyst is carried upward into a storage hopper. Originally, a 2-in. valve was used to permit air to enter the system. However, it was difficult to adjust this accurately, and frequently too much air would enter and erosion would occur in the carrier line, especially in its elbows.

A restriction orifice was installed upstream of the air valve. This orifice was calculated to give the catalyst a velocity of 20-30 ft. per second. When the 2-in. valve is opened to permit air to enter, it is simply opened all the way. The orifice insures against too great a velocity. Hence this has cut down the high erosion rates previously experienced.



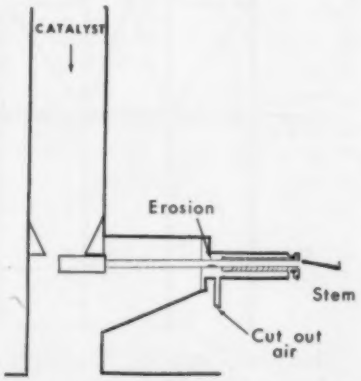
ORIFICE restricts catalyst flow.

Problem: Slide-valve stem.

Solution: Cut out bleed air.

EROSION was occurring on the top side of a slide valve stem. This valve was fitted with an aeration inlet. Air was injected to keep catalyst away from the stem's packing gland.

This very air, while at a low pressure, was enough to direct the catalyst against the top of the stem, thereby concentrating its effect in a small area and contributing to rapid erosion.



AERATION around slide valve stems can cause erosion.

The air was cut off and erosion of the stem was no longer a problem. Lack of aeration, meanwhile, had no adverse effects on the packing gland.

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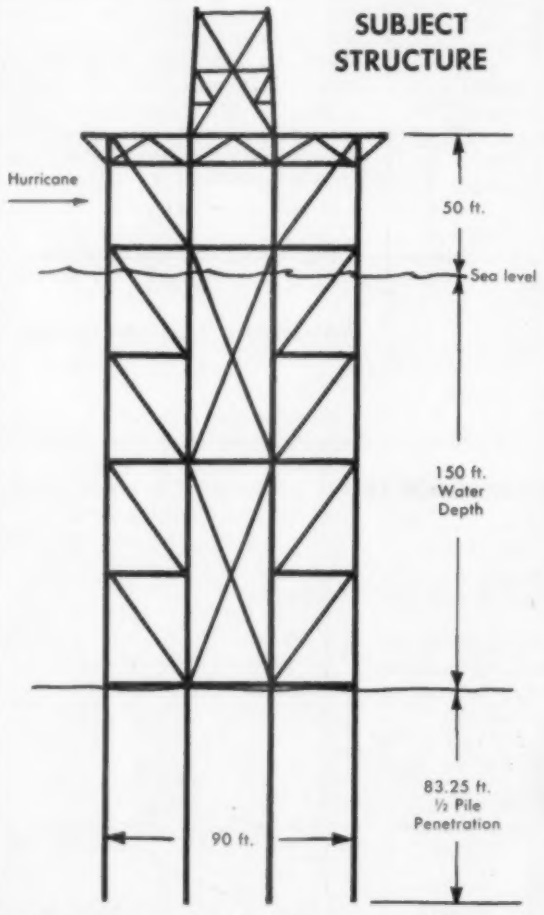
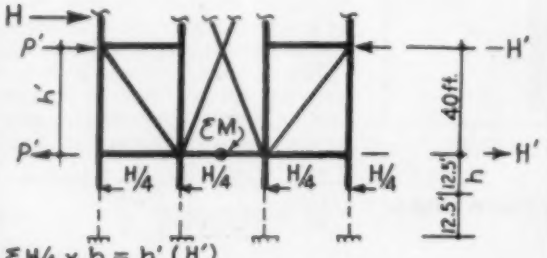
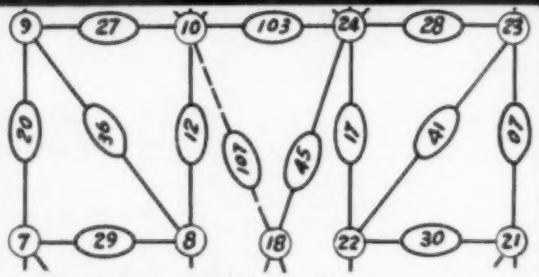


This is the structural configuration of the offshore drilling structure selected in working out the importance of secondary stresses in the design work.



The analysis of stresses was simplified by simulating additional external loads to compensate for certain internal shears caused by bending moments in the structure.

STEP 1



In the design procedure, the structure was loaded with simulated real loads of appropriate magnitude.

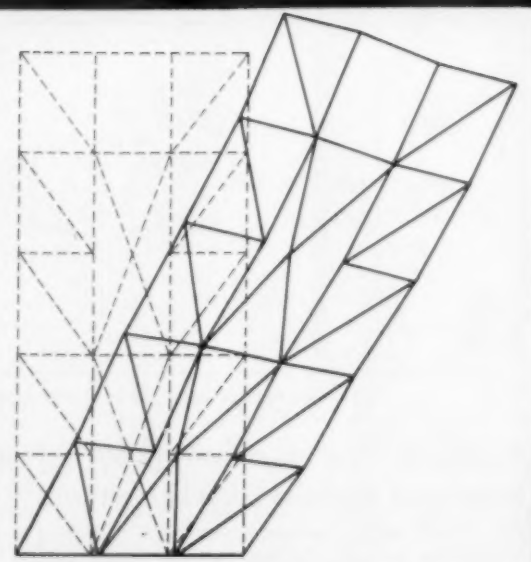
MARK	A"	L"	I"	r"	K·L/r	SIZE
01	83.1	480	12,750	12.37	26.6	36" × 3/4"
02	83.1	〃	12,750	12.37	26.6	〃
03	55.8	〃	8,570	12.40	17.5	36" × 1/2"
04	55.8	〃	8,570	12.40	17.5	〃

Tabulation was made of the necessary physical properties of the sections selected.

	TRIAL #1			TRIAL #2		
MK	S_x	SL/AE	L'	S_x	SL/AE	L'
01	1280+	638+	544	1265+	628+	543
02	810+	403+	520	808+	401+	520
03	579+	430+	523	570+	422+	522

After calculation, the stresses, changes in length, and final modified length for each member were tabulated.

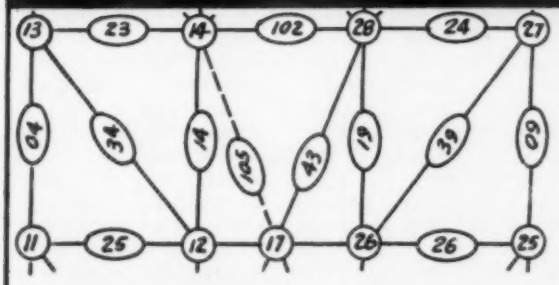
STEP 2



A deformation diagram was plotted using the magnified deformed lengths. The diagram was a conventional Marquardsen confgiuration. Relative joint displacements are scaled from the diagram, perpendicular to the original axis of the member.

design problem shows . . .

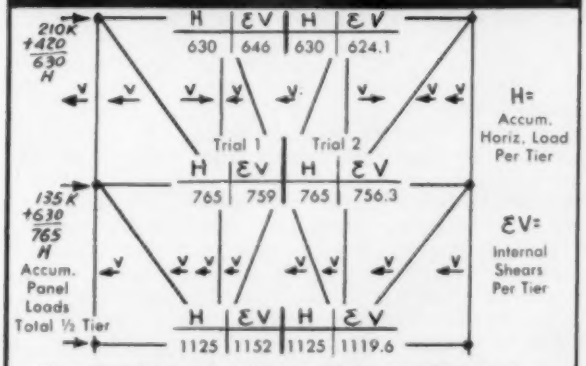
STEP 3



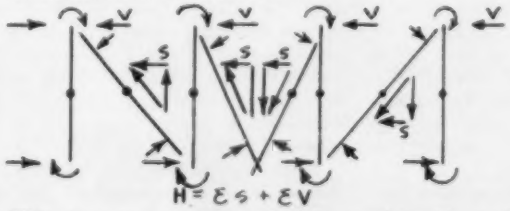
	TRIAL #1			TRIAL #2		
MK	Δ In.	GRKA Ft-Kips	BAL "M" Ft-Kips	Δ In.	GRKA Ft-Kips	BAL "M" Ft-Kips
01	1.07	870.0	114	1.12	900.0	107
02	0.88	716.0	23	0.91	731.0	44
03	1.14	603.0	95	0.86	454.0	12
04	0.96	507.0	28	1.02	539.0	35
05	0.80	327.0	130	0.82	337.0	83
06	1.08	873.0	115	1.14	916.0	127
07	0.85	710.0	22	0.89	715.0	44

The Hardy Cross method of moment distribution was then employed, using the digital computer. The diagram and tabulation show member deflection, fixed-end moments, and final balanced moments.

STEP 4



The final step in the analysis involved the calculation of unit stresses developed by axial loads and by bending moments and the combination of the two.



This is an example of the combination of stresses for one tier.

How important are

Secondary Stresses In Welded Offshore Drilling Structures

The authors say:

- . . . in structures left in deep water, they are highly significant and should not be ignored.
- A tendency for the shears produced by secondary bending to relieve the axial stresses is insignificant and can be ignored.
- Many members in a typical structure for bending stresses are nearly as high as the primary stresses and the two stresses are cumulative.
- High secondary stresses ignored in structure design can result mainly in permanent deformation or individual joint failure in the case of unsound welding.

By E. W. McMillin and L. B. Parker

SOME DESIGNERS believe that secondary stresses impair the load-carrying capacity of a structure, whereas others are of the opinion that they are so minor that they can be ignored. Still others think that they materially reduce primary stresses to the extent of alleviating themselves and, therefore, need not be considered.

The authors, having rigorously analyzed and studied this problem as related to a typical but hypothetical structure subjected to lateral hurricane forces, conclude that secondary stresses are significant but affect primary stresses only slightly.

Previous work . . . In May 1956, an article in this magazine described in general the method of analysis for secondary stresses and their approximate magnitude.[1] However, the present study has been extended in order to evaluate change in axial stress due

Author McMillin is professor of architecture, at University of Houston, and an associate of W. B. Joseph & Associates, of Houston. Parker is a senior civil engineer, Civil Engineering Division, Humble Oil & Refining Co., Houston.

to the effects of internal member shears as produced by secondary bending moments.

Since 1880, when Heinrich Manderle first published the results of a rigorous solution for finding secondary stresses in trussed frameworks, engineers have known that secondary stresses are of some importance in long-span heavily loaded trusses. However, it has been only in the last 30 years that bridge engineers have been taking these secondary stresses into consideration in the design of bridges, and then generally in spans of 250 ft. and over.

The conventional fixed-type offshore drilling structure is a cantilever truss subjected to powerful lateral forces and, as compared with bridges, would be equivalent to a span of approximately twice the length of the cantilever.

Structure analyzed . . . For the illustrative problem described herein, a hypothetical structure was analyzed in 150 ft. of water. Although no structures in the Gulf of Mexico have been constructed in this water depth yet, the trend is toward deeper water; and since secondary stresses are associated with deflection, their importance should increase with water depth.

The assumed structure has rather characteristic configuration and is loaded with forces comparable to the wave forces that would be imposed upon such a structure during a major hurricane. The member sizes for the framework were arbitrarily selected and would be fairly realistic for a structure of this size.

However, the final stress on each member is of no consequence in a theoretical environment, therefore no attempt was made to modify the member size to conform to the requirements for a real structure. The final stresses were used only as units of measure. A diagram of the structure and its loading is shown in Step 1.

Basis for the Study

Secondary stresses result from flexural moments produced in the truss members by the resistance of the joints to rotate freely. In short, they are the stresses produced by deflection normal to the axis of the members. This deflection is produced by joint translation when the over-all structure deflects due to the axial deformation of each individual member under its load.

According to the basic assumptions of statics, these secondary stresses do not contribute to the load-carrying capacity of the structure. Trusses are analyzed by statics with the simplifying assumption that all joints are composed of frictionless pins. In the case of the offshore structure, as in the case of other trusses with rigidly welded joints, this assumption of pin connections is only a starting point and is invalid without subsequent superposition of the state of stress caused by effects of the rigid joints.

This effect is the secondary stress. The ends of the members, being welded to a joint, are thus restrained against rotation to a certain degree and any relative joint displacement, causes lateral deflection of one end of a member relative to its other end, thereby producing a moment at the end of each member meeting at a joint. This final end moment produces flexural stresses in the member which are additive to the primary axial stresses.

Since the deflection is created by a vector summation of the individual axial deformations of all members of the truss, it is reasonable to state that the greater the primary stresses, the greater will be the secondary stresses. Since the primary stresses by nature of the pin joint assumption resist the entire load at each joint, there exists an interrelationship between primary and secondary stresses.

If additional stresses such as secondary develop inherently within the structure without increasing its load-carrying capacity, then the true primary stresses are of some lesser magnitude than the indicated primary stresses. The remainder of the resistance against the load must be represented by the secondary stresses.

Design problem . . . Some designers contend that designs can be based on primary stresses alone without considering secondary effects. This reasoning sometimes stems from the impression that, since the secondary stresses are believed to relieve the primary stresses, the sum of the real primary plus the secondary will be no greater than the indicated primary stresses.

There are others who use a reduced allowable stress as a criterion to assure themselves against the incidence of secondary stresses without calculating them.

There are many authorities in the field of structural engineering who have recognized this problem for years. The consensus is that unless the truss is of almost infinite stiffness, the shears produced by secondary bending moments will have negligible influence upon the initially calculated primary stresses.

The type of offshore drilling platform currently in use does not meet this almost infinite stiffness classification and, in reality, is quite flexible.

To quote some authorities who have discussed the problem of secondary stresses, Timoshenko and Young[2] state: "It is indicated that the axial forces calculated on the assumption of ideal hinges at the joints are not the exact values of these forces in the case of a truss with rigid joints. However, the discrepancy is small and usually can be neglected."

These authors then proceed with an example using numerical values and their solution shows that, when the maximum secondary stress is 50 per cent as large as the primary stress, the shearing force to reduce the primary stresses would be in the magnitude of approximately 3 per cent.

Grinter[3] proves in one example in his publication on indeterminate analyses that these shearing forces, produced by secondary bending, are less than 1 per cent of the true load on the structure and may be discarded as negligible.

Parcel and Moorman[4] state as follows: "We may say that the extreme limit for the effect of secondary bending in reducing the primary stress is approximately 5 per cent. The assumption that the primary stresses are practically unaffected by secondary bending thus appears amply justified."

It is interesting to note that in the same treatise Parcel and Moorman mention that in railroad-bridge trusses they have found secondary stresses as high as 75 per cent of the primary stresses. Thus, we see a situation where secondary stresses approach the magnitude of primary stresses yet do not reduce them by any more than 5 per cent.

Cantilever truss . . . It occurred to the authors, after reviewing the literature in the field, that most previous investigators have concerned themselves with bridges. This implies that the truss framework considered had a support at each end as well as, in some cases, intermediate supports. The offshore drilling structure is a huge cantilever truss fixed to the ocean floor by means of piling.

A review of the formulas for the deflection of cantilever beams as compared to simply supported beams will clearly illustrate that the cantilever, under equivalent load, will deflect several times the distance of the simply supported beam. Thus one could expect that the deflection of the drilling structure would be much greater than a bridge span of equivalent stiffness and twice its height.

Since the deflection is greater, it follows that the secondary stresses would be greater. The authors were concerned whether the secondary stresses were significant in this type

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of structure and whether or not they would substantially reduce the primary stresses.

Methods of the Analysis

There are three fairly conventional analyses for the solution of secondary stresses in truss frameworks. The first is a simultaneous solution of slope-deflection equations. The second is a slope-deflection solution executed by successive corrections. The third is a moment distribution method as developed by Hardy Cross.

The latter method was used by the authors for two reasons: (1) Moment distribution, because of its relatively recent advent and simplicity, is more widely used and understood by engineers. (2) A moment distribution program for the 650 electronic digital computer has been worked out by the University of Houston Computer Research Center and was available to perform the voluminous calculations necessary.

In brief, the entire procedure was as follows:

1. The structure was loaded with simulated real loads, the magnitude of which were realistic in terms of an actual offshore hurricane situation.

2. The members were assigned numbers and sizes and the physical properties of the sections selected; i.e. moment of inertia, area, length, radius of gyration, etc., were tabulated. The diagram in Step 1 shows how this tabulation was made. These sizes were selected in an aribitrary manner based upon design and construction practices for structures in lesser water depths.

3. The redundant members and reactions of the trussed jacket framework were isolated and cut back, thus rendering the structure statistically determinate.

4. At this point, the 650 electronic digital computer was employed to solve axial stresses in the members of the trussed framework. The indeterminate truss program developed by the University of Houston computer center solves these stresses in trusses with up to 99 members directly. Using techniques not described herein, trusses with even greater number of members can be solved with the same program.

Moreover, the computer is programed to evaluate the influence of each redundant upon all other members of the structure and to solve for primary stresses in all members including the redundants. In short, the computer will solve for the stresses produced by the real loads, the stresses produced by a unit load applied at each redundant, and the deflection of each joint to which a redundant is connected.

Then, utilizing Castigliano's theorem, it will develop the matrix inversion and solve the necessary simultaneous equations. Naturally, the designer must spend several hours "coding" the information that is to be supplied to the machine. This time, however, is negligible compared to the time consumed if a manual solution were attempted.

5. From the tabulation of true primary axial stresses in each member, the deformed length of each member is computed from the deformation expression PL/AE added algebraically to the original lengths. In order to plot the deformed structure graphically, the value of E is reduced by several hundred times which results in a magnified change in length.

The second tabulation in Step 1 shows the stresses, the change in length, and the final magnified length for each member.

6. A deformation diagram was plotted using the magnified deformed lenghths as are outlined in Step 2. The deformation diagram can be a conventional Williott - Mohr diagram or the Marquardsen diagram. The latter was used here.

7. The relative joint displacements are scaled from the diagram, perpendicular to the original axis of the member. These linear displacements represent the deflection of the end of each member with respect to its other end. Since both ends are assumed fixed against rotation before relaxation, a fixed end moment at each end results. This can be calculated by the well-known formula

$$\frac{6EK\Delta}{L}$$

8. The Hardy Cross method of moment distribution was employed at this phase of the operation. The digital computer was again utilized to expedite the many iterations required to balance the moments. Once more, the designer was faced with a few hours of coding time as compared to endless hours of manual calculations.

The diagram in Step 3 illustrates (a) the deflection of each member, (b) the fixed end moments resulting therefrom, and (c) the final balanced moments after distribution.

9. The shears in the vertical and diagonal members, as determined from the final balanced moments, were computed. Then, with the axial stress in all members being known, the frame was severed at each panel and the horizontal component of the stress in each diagonal computed.

The total of these diagonal components at any given level was added to the horizontal components of member shears for the same level and was compared to the corresponding external shear.

10. The real loads at each level were then adjusted in terms of the variance between external shears and internal shears. These adjusted loads were placed upon the structure and the entire process, as outlined above, was repeated. It should be noted that the new internal shears thus derived were compared to the external shears due to the original real loads and not to those produced by the adjusted loads.

This process can be repeated until any desired degree of accuracy is obtained. For the subject problem, two complete analyses were deemed satisfactory.

11. The unit stresses developed by axial loads and by bending moments were calculated and combined for both analyses. These results are indicated in Step 4.

The reader can now observe that the authors were in a position to make some fairly valid generalizations as to the magnitude of secondary stresses and their influence upon primary stresses.

Results and Conclusions

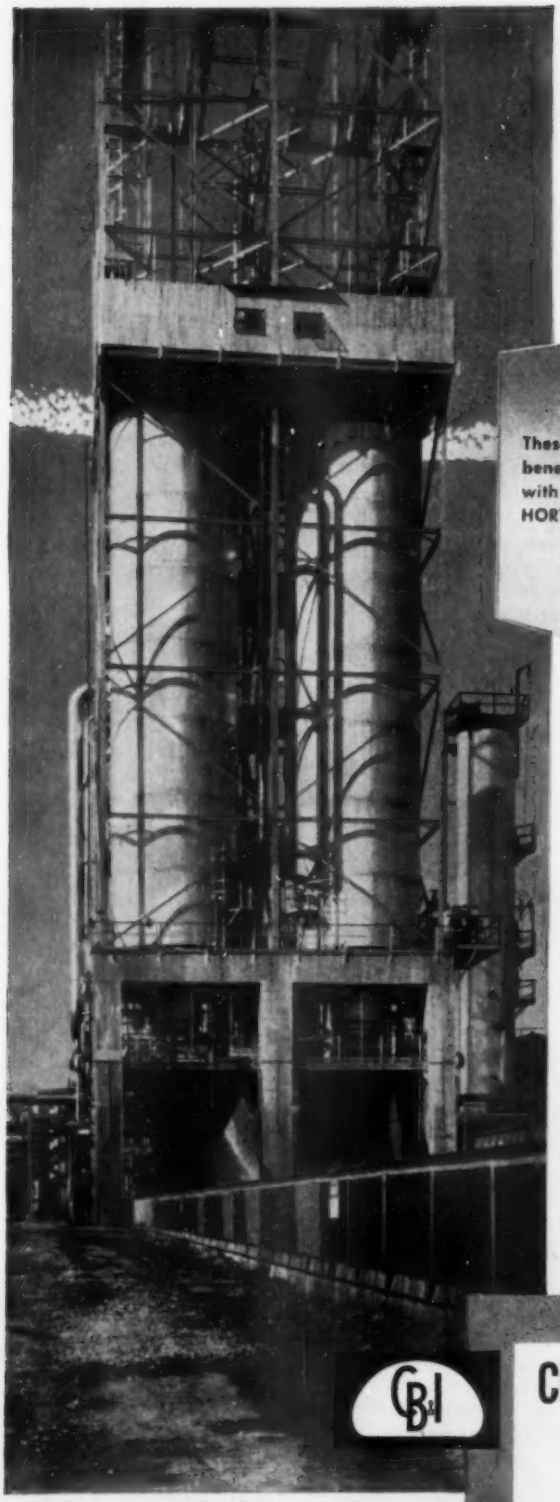
Initially, it is conceded that two considerations were omitted in the analysis. They are as follows: (a) the magnitude of errors that result from change is length of compression members due to curvature, (b) the stiffening influence of large weld areas or possible gussets. Generally, these two factors are trivial in a large structure.

On the basis of this investigation, the authors can only conclude that **secondary stresses in offshore drilling structures placed in deep water are of significant magnitude and should not be ignored,** and **the tendency for the shears produced by secondary bending to relieve the axial stresses is insignificant and can be ignored.**

It was found that this reasonably typical structure had many members in which the bending stresses were nearly as high as the primary sresses and, inasmuch as the two stresses are accumulative, the final stress would be nearly twice that of the primary stress in certain members. Also, the secondary stresses relieved the axial stresses by only 2 per cent as an average.

The latter are statements of the results and the authors further conclude as follows:

1. Offshore structures of the fixed-in-place type are inherently flexible



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and as such can deflect readily without influencing their load-carrying capacity. The authors' original thinking engrossed the idea that a cantilever-type truss, being subject to large deflections, would develop very high secondary stresses.

It was thought that these bending stresses in turn might result in member shears of significant magnitude and thus reduce the primary stresses substantially. This, apparently, is not the case. The joint rotation relieves these fixed end moments to such an extent that the resu'ting shears are trivial.

We can conclude, therefore, that the primary stresses, as initially calculated, are in astonishing proximity to the final primary stresses. The designer is simply wasting his time to successively correct the structure for sidesway.

2. The secondary stresses produced by deflection are, after one trial, very close to the real bending stresses and physically exist as additional unit fiber stresses. They are stresses of such magnitude in the case of certain members that the total combined primary plus secondary stress could well exceed the elastic limit of the material.

Buckling and other forms of permanent deformation could result. This could be particularly serious should these high stresses be repetitive through many cycles at a high frequency over a period of 2 or 3 days. It is highly probable that fatigue would occur with such a repetitive stressing situation at or above the yield point. Moreover, mediocre welding at the joints might result in a failure of individual members requiring that they be replaced under water.

The authors can offer two suggestions: (a) Frames be analyzed accurately for secondary stresses, and (b) frames be analyzed for primary stresses only, but that an appropriate reduction be made in the allowable stress to offset for the incidence of secondary stresses.

3. Provided that all joints are securely welded, it is doubtful that secondary stresses, as an entity, would ever produce complete failure of the structure. The fixed end moments resulting from deflection were of a high magnitude but after joint rotation took place, the structure relieved itself of a large percentage of the initial moment.

This occurred in members stressed less than the allowable. Should the members be stressed close to yield or above, the joints, due to plastic behavior, would rotate to a degree greater than the calculated rotation, thus relieving the bending stresses.

The authors are of the opinion that high secondary stresses ignored in the design can result mainly in permanent deformation or individual joint failure in the case of unsound welding. Aside from weld failures, the structure might still serve its purpose. The reader should bear in mind that the latter statement is only the opinion of two individual engineers, and may be somewhat optimistic.

Most surely, permanent deformation of a million-dollar structure inplace in the ocean would represent an enormous expense should it be required to replace 25 per cent of its structural elements.

Interpretation

The method of analysis has, heretofore, been described in general. It is the intent here to clarify a few points for the benefit of those engineers who specialize in the design of offshore structures or any other highly indeterminate structure. It is recognized, that for this rather specialized group, it will not be necessary to go into any intricate detail.

The first sketch exemplifies the structure as a single unit and the designer will note the simplifying assumption that the piles dissipate their loads into the soil by skin friction throughout the upper one-half length of the pile. The true length of pile to be used for computing axial deformation under load is somewhat problematical, and the authors are assuming a conservative length in accordance with accepted practice.

The horizontal loads have been adjusted to a net load. This is in concession to the bending moment in the jacket leg extension due to the soil load thereon together with the bending moment in the jacket leg induced by shear in the pile. This causes substantial additional member shears in the lower panels.

For simplifying the analysis, this effect has been simulated by additional external loads to compensate for those internal shears caused by the aforementioned moments. The second sketch illustrates this concept.

The difference in axial stresses in each member between the first trial and the second trial is inconsequential. Therefore, it would follow thus that the difference in combined stresses between the first trial and the second trial would be equally insignificant.

This was proved in the calculations. It must be admitted that the moments were more sensitive to shear adjustments than were the primary stresses.

Upon examination, the sketch in Step 4 is indicative of the very small amount of difference between horizontal panel loads and internal panel shear resistance for the first trial and the second trial. This clearly defines that in this very huge and heavily loaded contilever truss the shears produced by secondary bending in the vertical and diagonal members were minimum in nature and relieved the initial primary stresses to an insignificant magnitude.

It can be noted that we were about as much out of balance with respect to horizontal equilibrium on the second trial as they were on the first. However, since it was obvious that the anomaly involved nothing but minutiae, a third, fourth, or fifth trial was neglected.

The majority of the members are unaffected by bending, but roughly 25 per cent are seriously influenced by secondary stresses. These members, if designed for axial stresses only, would be only half as strong as required. Under hurricane conditions, they would suffer permanent deformation.

Again, we wish to state this frame is hypothetical. The loads and members are both assumptive but closely correlate with reality. The experienced structural or civil engineer would immediately recognize that a readjustment of member sizes would be required should this be a design considered for construction.

We recognize this necessity but have neglected to do so since the readjustment of member sizes would not materially after the results of this investigation.

Acknowlegment

1. To Dr. Elliott I. Organick, and the staff of the computer center of University of Houston for cooperation in programing, coding, and keypunching this problem for solution on the 650 IBM digital computer.

2. To University of Houston for its policy in granting machine time to faculty members for research problems on a gratis basis.

3. To R. W. McDonald, associate of the firm of W. B. Joseph & Associates, consulting engineers, for technical advice on the analysis of statistically indeterminate structures.

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PRODUCTION

Fracturing 89 Per Cent Successful

Here are the salient figures . . .

By George R. Locker

A total of 37 Fullerton Clearfork Unit wells have received fracture treatments. Thirty-three of these fracture treatments are considered successful. The gross expenditure for the 37 treatments totaled $249,888 for an average of $6,754 per well. This expenditure had been repaid and a profit after payout of $63,280 realized. Current additional monthly income derived from the fracture expenditure is $27,727.

Following fracture treatments the cumulative total allowable produced from these wells to September 1, 1957, has been 213,000 bbl. of oil. Of this total 156,000 bbl. represent the increase over the prefracture allowable. It is felt that the 156,000 bbl. of increased oil has been produced with negligible increase in operating expense so that a very considerable savings in required operating expense per barrel has been effected due to this feature.

As a result of these fracture treatments a current increase of 867 bbl. of oil per allowable day has been obtained. With approximately 22 months production history since the first Clearfork Unit fracture treatment, the current average increase in daily allowable is 26 bbl. of oil per well in the successfully fractured wells.

The author is petroleum engineer for Fitting & Jones, Midland, Tex. This article was prepared while Locker was unit reservoir engineer for the Fullerton Clearfork Unit, Monterey Oil Co., unit operator, to whom appreciation is expressed for this material.

THE Fullerton Clearfork Unit fracture program has been confined to the limited-producing-capacity edge wells. These wells are characterized by very low oil productivities and by relatively low porosity and permeability development. Fracture treatment results have shown that substantial increase in well productivity can be effected in the Fullerton Clearfork reservoir.

The most favorable response to fracturing has been in the area joining the north and south domes where relatively high potentials following fracture treatments have been obtained and maintained through the first 6 months' history in this area. Response to fracturing in the northwest portion of the north dome appears favorable. The extreme northeast acreage of the north dome has not responded to fracture treatments as evidenced by the lack of productivity increase following fracture treatments from Unit Wells No. 9-1 and No. 10-3.

The central portion of the reservoir has no yet been fractured although substantial increases in well productivities could probably be obtained from fracture treatment. Field gas-oil ratio penalty of 2,000 cu. ft. per barrel establishes the allowed oil production rate from the better unit acreage. A successful fracture treatment in a 6,000 cu. ft. per barrel ratio well might increase the well productivity to 100 bbl. of oil per day, but would not necessarily lower the producing ratio and therefore the basic allowable would still be limited to 22 bbl. of oil per allowable day.

Fracture treatment expense . . . "Authorizations for expenditure" were approved by the Fullerton advisory committee in the total amount of $283,750 for the purpose of fracturing these 37 Fullerton Clearfork Unit wells. The gross expenditure was $249,888 and represents an under-expenditure of approximately $34,000.

The latest AFE, approved in the amount of $69,800, had an actual expenditure for the 10 fracture treatments totaling $62,942.

A detailed summary of fracture treatment expense is presented in Table 2. The treating expense feature includes the cost of fracture pumping equipment, fracturing fluids, fracturing fluid additives, and fracturing fluid sand. Well-service-company expense includes the pulling-unit charges in preparing the well for fracture treatment and in completing the well following fracture treatment. The equipment-rental feature includes the expense of reverse-circulation equipment required to clean out sand fillup in some fracture treatments. The roustabout expense is required for lease preparation and lease cleanup following fracture treatment. Tank and oil-hauling expense is required to provide temporary storage at the well site for fracture-treating fluid and to haul the lease crude when employed as a fracture fluid. Equipment purchase includes miscellaneous well connections. The dump-bailer charge has been eliminated with the construction and operation of a unit-owned sand-dump bailer employed in placing a 50-ft. sand cushion in the bottom of the open-hole section.

Allowable increase . . . To September 1, 1957, the increased basic allowable from the fracturing of the 37 wells amounted to 127,419 bbl.

During this same period these fractured wells produced an additional 86,156 bbl. of oil (28,567 bbl. resulted from transfer of allowable and gas-injection credit application to the fractured wells, while 57,589 bbl. represented the total cumulative monthly allowable based on prefracture allowable rates).

Current total monthly allowable from the 37 fractured wells is 21,320 bbl., of which 7,397 bbls. represent the prefracture basic allowable, 10,881 bbl. represent the basic allowable increase resulting from fracturing, and 3,042 bbl. represent the transfer and injection credit allowable. Only the basic allowable increase has been employed for payout purposes.

Operating expense benefits . . . Considerable economic benefit has been

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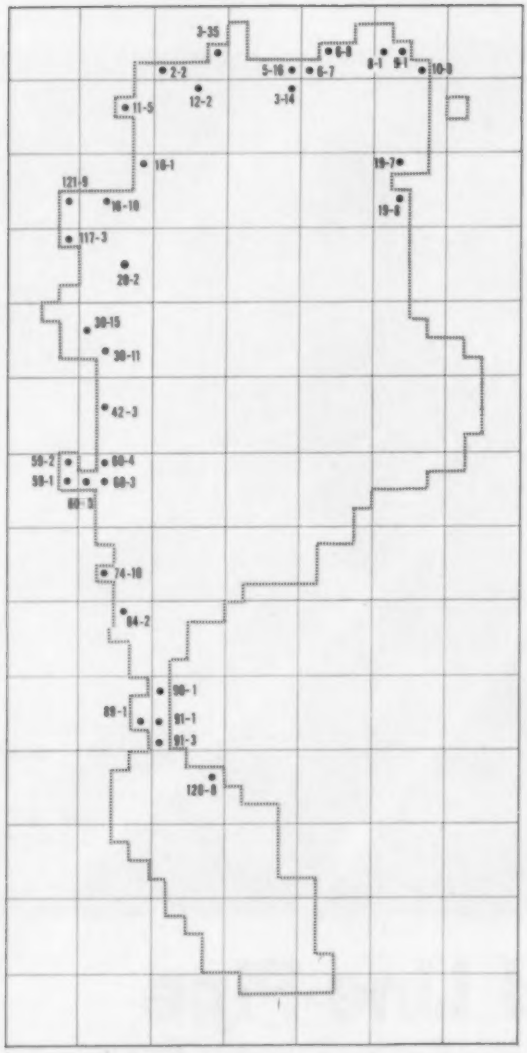
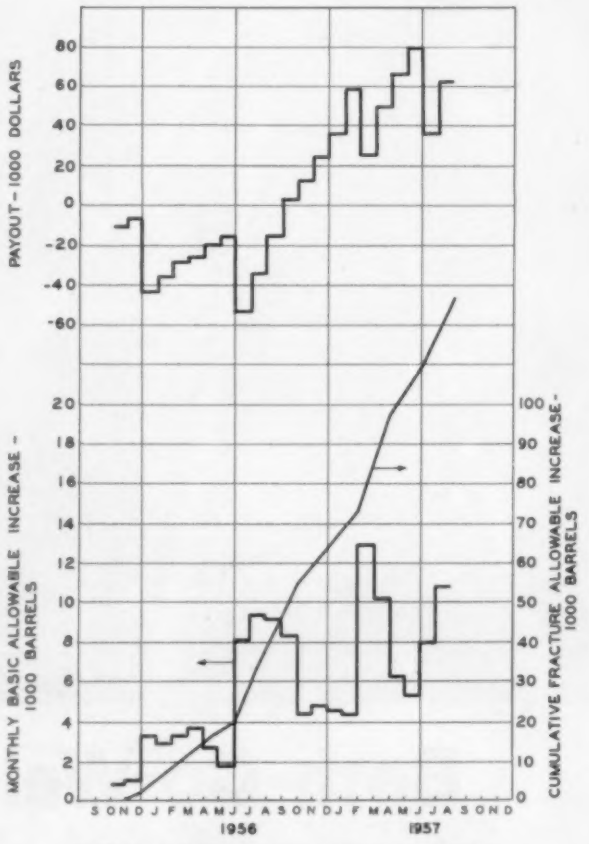
"Considerable economic benefit has been derived in operation expense required to produce oil from these 37 fractured wells."



FRACTURED WELLS in Fullerton Clearfork unit.


PAYOUT - 1000 DOLLARS
MONTHLY BASIC ALLOWABLE INCREASE - 1000 BARRELS
CUMULATIVE FRACTURE ALLOWABLE INCREASE - 1000 BARRELS
S O N D J F M A M J J A S O N D J F M A M J J A S O N D
1956
1957

PAYOUT and allowable increase status at Fullerton.

derived in operating expense required to produce oil from these 37 fractured wells. Prior to fracture treatments, the average allowable for these 37 wells was less than 15 bbl. of oil per producing day, or less than 250 bbl. of oil per well per month. This rate of oil production from a depth of 7,000-ft. particularly from wells requiring pumping or other artificial-lift equipment, resulted in low operating profit per barrel of stock-tank oil.

The total increase in oil production from these wells following fracture treatment has been 155,986 bbl. of oil as of September 1, 1957. Negligible additional operating expense has been incurred in the production of this increased oil and in some cases the operating expense has been reduced due to the elimination of pumping equipment following fracture treatments.

Productivities, gas-oil ratios, and recoveries . . . During the maximum 22-month period following the first fracture treatments some decline in well productivity has occurred. For example, Unit 60-5 was fractured during October 1955. Prior to fracture treatment, this well had an allowable of 11 bbl. of oil per producing day. Following fracture treatment, this well was repotentialed for top allowable of 66 bbl. of oil per producing day and subsequent semiannual GO-2 tests have resulted in reduction from top allowable to 50 bbl., to 33 bbl., and then to the current 30 bbl. of oil per producing day. The latest pumping test shows a production of 23 bbl. of oil, 7 bbl. of water, and producing gas-oil ratio of 5,496 cu. ft. per barrel. A fairly stable rate of oil production has been in effect during the last 9 months' well history.

The successful fracture treatments have resulted in substantial increases in oil producing rates. Two to three months producing history following fracture treatment has resulted in increases in producing gas-oil ratios in several of the flowing fractured wells. Other fractured wells have maintained top allowable production due to low producing ratios for periods greater than 1 year following fracture treatments.

Effects on artificial-lift wells . . . Twenty-six of the fractured wells were equipped with conventional or Kobe pumping equipment prior to fracture treatment. Sixteen of these wells were returned to a flowing status following fracture treatment and are at this time still flowing. A maximum of 18 months' flowing history on a fractured well which was previously

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Table 1—Fracture Treatments

Well number	Fracture fluids	Volume 1,000's gal.	Sand 1,000's lb.	Treating rate BPM	Surface treating pressure psi.	9-1-57 payout status $	Prefrac. allowable	Post frac. allowable	Current allowable
60-5	Dolofrac	20	20	20.0	2,650	+19,895	11	66	30
59-1	Frac-acid	20	20	24.0	2,500	+10,075	*26	66	27
59-2	Refined crude	40	40	28.0	2,550	+ 4,712	*19	66	10
60-4	Solufrac	20	25	24.0	3,850	+ 5,710	14	66	16
30-15	Solufrac	20	25	25.0	2,050	+ 5,020	15	53	23
16-10	Gelled crude	40	50	24.5	3,000	— 7,450	15	15	15
117-3	Gelled crude	20	20	11.0	4,050	—10,548	10	10	‡10—17M
74-10	Solufrac	12	25	25.0	2,400	+ 7,183	15	66	30
	Control frac	12							
84-2	Solufrac	12	31	31.3	2,650	+ 8,298	*19	66	30
	Control frac	12							
89-1	Control frac	30	45	33.3	2,850	+11,217	*15	66	36
91-3	Solufrac	10	37	31.8	2,500	+17,630	*19	66	66
	Control frac	15							
60-3	Control frac	30	45	28.3	2,200	+ 8,101	15	27	25
42-3	Control frac	30	45	28.3	2,600	+14,425	17	66	22
30-11	Lease crude	30	30	25.0	2,200	+ 4,883	5	66	12
16-1	Acid &	10	37	24.0	2,500	+ 4,352	14	66	22
	gelled crude	15							
11-5	Solufrac &	10	32	27.3	2,700	+ 1,932	*21	66	19
	control frac	15							
9-1	Solufrac &	10	32	27.0	2,800	— 2,208	12	61	12
	control frac	15							
10-3	Solufrac &	10	37	23.5	2,900	— 6,243	* 9	21	† 9—16
	control frac	15							
8-1	Lease crude	30	45	28.1	2,800	— 1,310	*13	66	21
6-8	Solufrac &	10	37	26.3	2,600	+ 4,341	3	51	51
	control frac	15							
79-2	Acid &	10	45	29.7	3,800	— 3,256	*11	*50	*38
	crude	20							
2-2	Solufrac-	10	35	26.9	2,850	— 6,087	*30	66	23
	crude	15							
79-3	Acid &	10	36	30.2	1,850	— 1,304	10	41	28
	crude	15							
87-4	Lease crude	30	45	26.5	4,500	+ 2,657	* 7	66	30
90-1	Lease crude	30	30	28.5	2,400	+ 2,841	17	66	42
91-1	Lease crude	30	§30	22.5	2,600	+ 4,735	*21	66	66
79-1	Lease crude	30	30	33.2	2,200	+ 1,868	8	66	33
3-14	Lease crude	30	§30	28.5	2,900	— 6,397	14	66	66
3-35	Lease crude	30	§22	30.9	2,600	— 4,127	22	66	66
5-16	Lease crude	30	§22	36.9	2,650	— 3,220	*22	66	66
6-7	Lease crude	30	§22	27.4	2,600	— 1,799	12	66	66
12-2	Lease crude	30	§22	27.0	2,800	— 3,560	22	66	66
19-7	Lease crude	30	15	30.4	2,400	— 361	17	66	66
19-8	Lease crude	30	15	27.7	3,000	— 1,729	* 6	66	66
20-2	Lease crude	30	22	28.2	2,600	— 6,691	* 9	66	66
120-8	Lease crude	50	32	26.0	2,300	— 5,106	*19	66	66
121-9	Acid &	10	12	23.6	2,650	— 5,199	* 6	66	66
	lease crude	20							
37	WELL TOTALS					$+63,280	540	2,177	1,406

*Comparable allowables for marginal wells. Based upon 30 calendar days and 16 producing days.
†Currently transferred from this well and therefore not employed in the payout. This allowable is not included in current allowable total.
‡This allowable resulted from deepening and is not included in current allowable total.
§Plus 1,500 lb. F-3

pumped has been observed. Several fractured wells which were previously pumped have been on a flowing status for a total of 14 months.

Individual treatments . . . The fracture-fluid volumes, treating pressures, and treating rates for the individual well treatments are detailed in Table 1. The payout status for each well as of September 1, 1957, is also presented in this table. Several different types of fracture fluids have been employed and fracture fluid volumes have varied from 20,000 to 50,000 gal. per well with sand rates varying from ½ to 1½ lb. per gallon of fracture fluid. With one exception the surface treating pressures have ranged between 2,000 and 3,800 psi.

Fracture treatments have been down the casing with the tubing string removed from the well bore. The treating rates have been in excess of 25 bbl per minute.

Acid-kerosine emulsion, gelled acid, gelled lease crude, refined crude, plain lease crude, and plain lease crude with a fluid-loss additive have been used as fracture fluids in the various jobs. Several combination treatments consisted of 10,000 gal. of acid-base fluid spear-heading the fracture fluid, followed by 15,000 gal. of plain lease crude. These combination fluid treatments have been used to obtain the desired acid chemical reaction in the dolomitic reservoir in addition to the mechanical fracturing benefits at a reduced fracturing expense.

For the 10 fracture treatments performed under the most recent authorizations for expenditure, five of the treatments were with plain lease crude plus fluid-loss additive, four were with plain lease crude, and one fracture treatment was with a combination of acid-base liquid plus plain lease crude. It appears that the fluid-loss additive has not been effective in eliminating sand fallout in the open-hole section and a fluid-loss additive will not be used in future fracture treatments.

Fracture-fluid results . . . Results from the use of various fluids in fracturing indicate that the Fullerton Clearfork dolomite reservoir is susceptible to each of these various liquids. A brief

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Table 2—Fracture-Treating Expense

Well number	Treating expense	Well service company expense	Equipment rental	Roustabout expense	Tank and oil hauling	Dump bailer	Total
16-10	4,945	1,730		244	378	153	7,450
30-15	5,266	1,627		393	255	167	7,708
59-1	5,863	1,655		212	473	155	8,358
59-2	5,384	3,414		228	161	*283	9,470
60-4	5,668	1,088		567	124	*171	7,618
60-5	7,875	1,880		371		*156	10,282
117-3	4,449	4,350	481	311	702	*255	10,548
Total	39,450	15,744	481	2,326	2,093	925	61,434
9-1	4,764	282		256	304		5,606
11-5	4,687	349		534	247		5,817
16-1	5,322	318		544	185		6,369
30-11	2,288	*1,683		203	247		4,421
42-3	4,007	465		611	238		5,321
60-3	4,007	830		525	288		5,650
74-10	4,720	1,413	118	169	144	150	6,714
84-2	5,240	825		185	367	150	6,767
89-1	4,229	851		440	289	150	5,959
91-3	4,775	1,462		441	113	22	6,813
Total	44,039	8,478	118	3,908	2,422	472	59,437
2-2	4,166	2,634	90	334	369		7,593
6-8	4,884	1,113		214	193		6,404
8-1	2,709	2,752	733	729	431		7,354
10-3	4,981	1,128		372	249		6,730
79-1	3,313	1,747	1,356	335	210		6,961
79-2	4,822	2,025	1,949	338	272		9,406
79-3	4,721	1,060		226	414		6,421
87-4	2,759	1,926	426	349	45		5,505
90-1	2,934	1,109		403	317		4,763
91-1	2,525	1,433	404	281	295		4,938
Total	37,814	16,927	4,958	3,581	2,795		66,075
3-14	4,896	1,070	1,960	1,389	408		9,723
3-35	3,952	1,154	979	442	415		6,942
5-16	3,155	1,414	319	405	294		5,587
6-7	3,155	1,204	319	201	374		5,253
12-2	3,677	1,141	879	349	329		6,375
19-7	2,144	752		282	317		3,495
19-8	2,182	930		174	329		3,615
20-2	3,404	2,838	1,083	492	600		8,417
120-8	3,244	2,371	713	294	464		7,086
121-9	4,666	1,150		270	363		6,449
Total	34,475	14,024	6,152	4,298	3,893		62,942
TOTAL	155,778	55,173	11,809	14,113	11,203	1,397	249,888

*Includes some equipment purchase.

resume of the fracture treatment results by type of fracture fluid is as follows:

Acid-base fluids. Straight acid-base fracture fluids have been employed in the two treatments. Each of these treatments consisted of 20,000-gal. volumes. Fracture fluid, sand and pump truck expense averaged $6,870 per well and total fracture treatment expense averaged $9,320 per well. Each of these treatments was successful.

Acid-kerosine emulsion fluids. Straight acid-kerosine emulsion fluid has been used in two treatments. Treatment results in these wells compare favorably with any other type. Average per well fracture fluid, sand and pump-truck expense for these two jobs was $5,460 and total fracturing treatment expense averaged $7,660 per well.

Combination treatments. Combination acid-kerosine emulsion, or gelled acid ahead of gelled lease crude, treatments have been used in a total of 12 fracture treatments. The majority of these treatments consisted of 10,000 gal. acid-base fluid plus 15,000 gal. of plain or gelled lease crude. Fracture fluid, sand, and pump-truck expense for these 12 jobs averaged $4,820 per well. Treatment results with the combination fluids appear to be quite successful. The average total fracturing treatment expense for the combination jobs has been $6,750 per well.

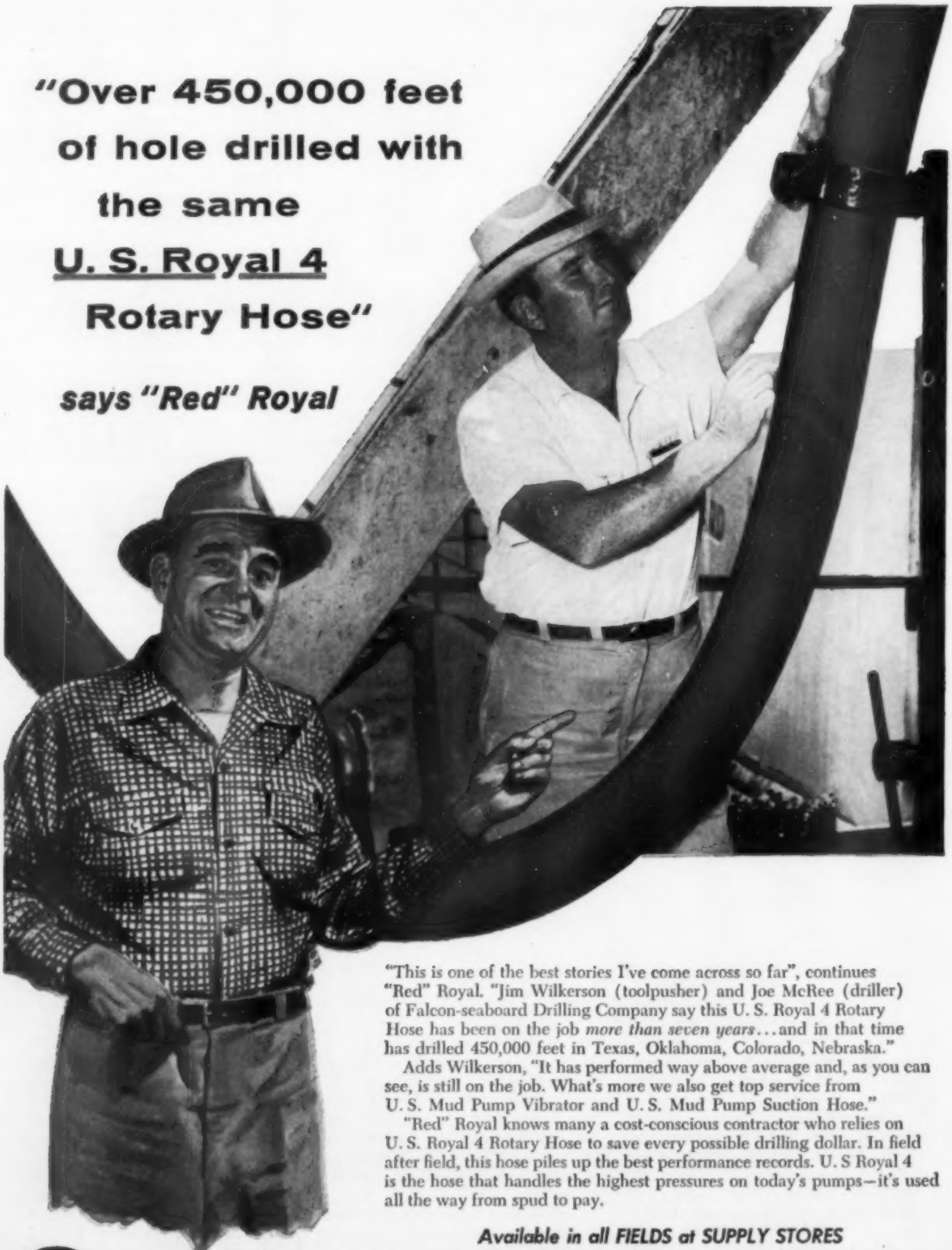
Gelled lease crude. This has been used on five treatments. These treatments averaged 30,000 gal. of gelled crude with 45,000 lb. of sand per treatment. Production results following gelled lease crude treatments compare favorably with results derived from other fracture fluids. The average expenditure for fracturing equipment and treatment of the lease crude in these gelled crude jobs was $4,350 per well. Excepting the complicated treatment for Well 117-3, the average total fracture treatment expenditure for the remaining four gelled lease crude treatments was $6,100.

Plain lease crude. Fifteen plain-lease-crude fracture treatments have been used. Nine of these treatments were with 30,000 gal. fracturing-fluid volume and the tenth treatment was with 50,000 gal. fracturing-fluid volume. The first six treatments had sand content of 1 to 1½ lb. per gallon, while the four most recent treatments had sand content of ½ to ¾ lb. per gallon. A fluid-loss additive has been used in some of the lease-crude treatments but this additive has not been effective in eliminating sand fallout in the open-hole section. These lease-crude treatments have been employed in wells which had relatively high acid volumes at the time of their initial completion. Treatment results with lease crude are considered to compare favorably with results from other types of fracture fluids. The average treatment expense for sand and fracture pump trucks for the plain-lease-crude jobs and the lease-crude jobs with fluid-loss additive has been approximately $3,100 per well. The average total fracture treatment expense for this group of wells has been approximately $5,850.

Refined crude. This was used in one treatment. Reservoir response to this fluid appeared favorable although the well was extremely slow responding to reservoir reaction, apparently due to the relatively high viscosity of the refined crude. Additional refined-crude treatments are not planned due to this relatively high-viscosity feature. Lease crude is available from unit producing wells in sufficient quantity to provide the required fracture fluid volumes for unit fracturing program. This lease crude is considerably less expensive than the refined crude. **End.**

"Over 450,000 feet of hole drilled with the same U. S. Royal 4 Rotary Hose"

says "Red" Royal



"This is one of the best stories I've come across so far", continues "Red" Royal. "Jim Wilkerson (toolpusher) and Joe McRee (driller) of Falcon-seaboard Drilling Company say this U. S. Royal 4 Rotary Hose has been on the job *more than seven years*...and in that time has drilled 450,000 feet in Texas, Oklahoma, Colorado, Nebraska."

Adds Wilkerson, "It has performed way above average and, as you can see, is still on the job. What's more we also get top service from U. S. Mud Pump Vibrator and U. S. Mud Pump Suction Hose."

"Red" Royal knows many a cost-conscious contractor who relies on U. S. Royal 4 Rotary Hose to save every possible drilling dollar. In field after field, this hose piles up the best performance records. U. S Royal 4 is the hose that handles the highest pressures on today's pumps—it's used all the way from spud to pay.

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How to protect pipeline stations against

1. Lightning
2. Power-line switching

Proper protection of pipeline stations against transient disturbances consists of the following:

1. **Station-type lightning arresters at transmission voltage level for transformer supplying station.**
2. **Surge protection on station bus consisting of a station-type lightning arrester and surge capacitor in parallel located a minimum distance from the bus connection.**
3. **Power supply system having either:**
   a. **Dead line check relaying.**
   b. **Time delay automatic reclosure.**

By E. B. Turner

GENERALLY SPEAKING, protection of electrical equipment against transient disturbances must be provided in two classifications:

- Protection from direct strokes of lightning.
- Protection from traveling waves.

Protection against direct strokes will not be covered here, since most installations with which we will be concerned have relatively limited exposure to direct stroke. The area which is exposed is usually the transmission system, and this is protected by the utility company. Therefore, protection against traveling waves is the problem of greater concern in this paper.

These traveling waves can be the result of direct lighning strokes out on the line, insulator flashover, or induced by lightning stroke on adjacent lines. The fourth possibility is switching surges which cause a steep front wave to be transmitted along the line. When this traveling wave reaches a point in the system which has a different surge impedance, reflections result which have magnitudes of the order described by the equation

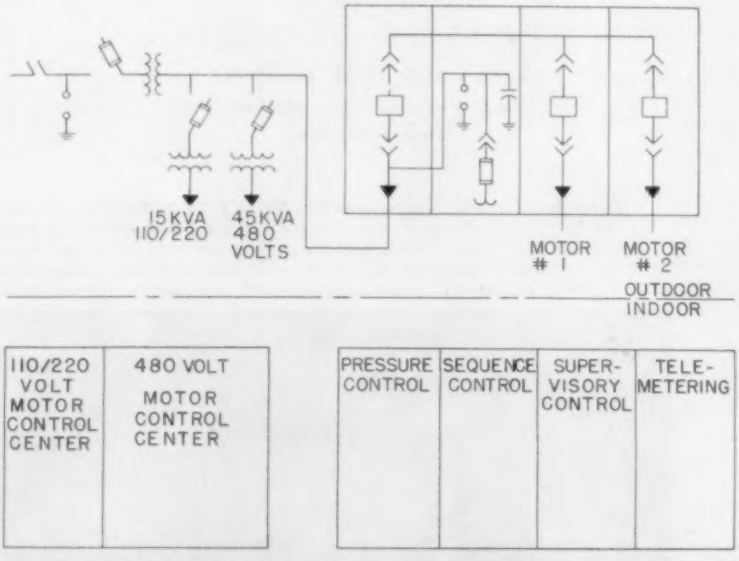
$$E_2 = 2E_1 \frac{Z_2}{Z_1 + Z_2} \quad \text{(Appendix 1)}$$

Where

E_1 = incoming voltage
E_2 = outgoing (refracted) voltage
Z_1 = surge impedance of incoming line
Z_2 = surge impedance of outgoing line

In almost every instance, oil-pipeline stations have station lightning-arrester protection. The station is usually supplied by stepdown transformers reducing the incoming line voltage from the transmission level to either 2,400 or 4,160 volts. By examining Fig. 1, it can be seen that the exposure to direct strokes of lightning is at the substation. This equipment is usually furnished by the electric utility with the proper lightning protection.

When a traveling wave is imposed upon the high side of a transformer, different magnitudes of transient voltages are encountered depending upon the size and connections of the transformer. The resulting voltage appearing at the motor terminals transmitted through a given transformer depends upon the kilovolt-ampere size of the



OIL PIPELINE STATION is shown in typical electrical one-line diagram and functional block diagram. **Fig. 1.**

Author is with General Electric Co. Paper presented at AIEE Petroleum Industry Electric Conference, Philadelphia.

Tubing stretch mill, Youngstown, Ohio. Electronically controlled mill to be completed during second quarter of 1958 . . . will provide increased production for Tubing comparable to our increased capacity for Casing. Both Upset Finishing Mill and this facility will greatly augment our existing No. 1 and No. 2 Seamless Mills in Youngstown. Photo shows mill building under construction.

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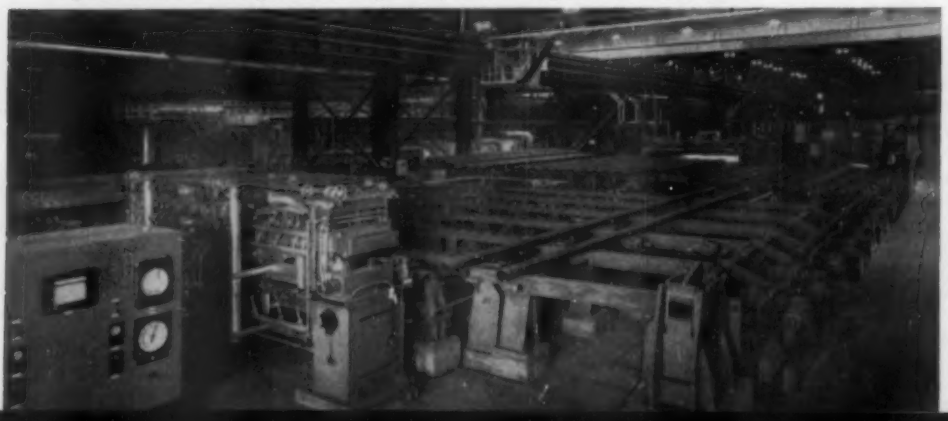
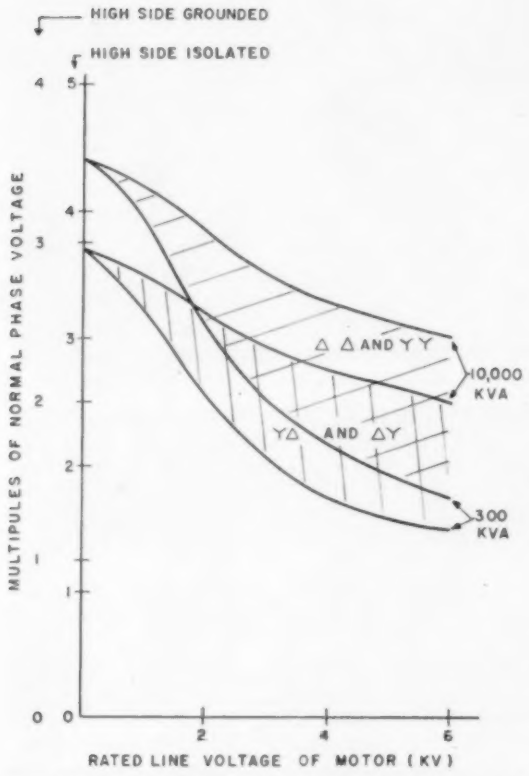
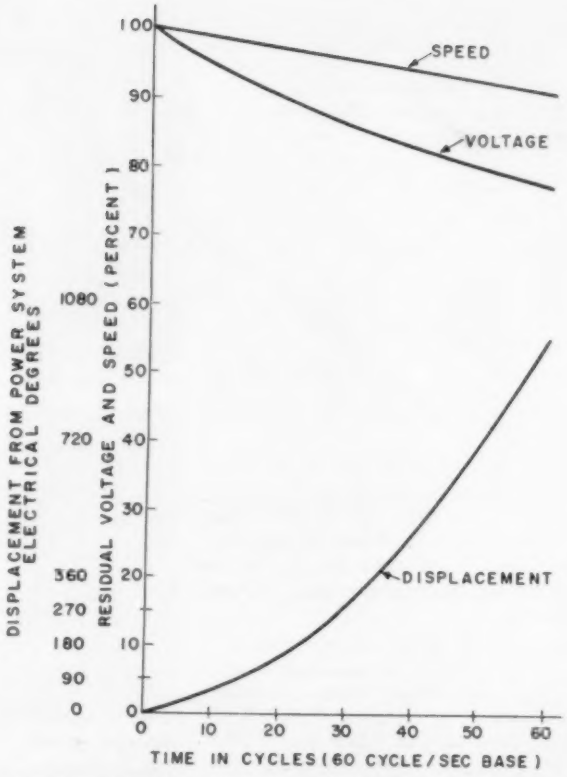
Upset finishing mill, Youngstown, Ohio. Also a fully automated mill began operations September 15. Contains a pair of automatic upsetters with attendant furnaces plus a full-length normalizing furnace for highest quality control of all products. This mill adds to our capacity for Drill Pipe in grades D, E, x-95 and in Upset Casing (Speedtite). Photo shows upsetter and control panel in foreground, normalizing furnace in left rear.





EXPECTED MAGNITUDES of surge voltages transmitted through transformers. Fig. 2.



TEST RESULTS are shown for power interruption on 1,250-hp. motor operating with 180-kva. of power factor corrective capacitors. Fig. 4.

transformer and voltage level of the motor. It appears to be independent of the transformer ratio if the ratio exceeds 4:1.[1]

Fig. 2 illustrates the maximum expected magnitudes of surge voltage appearing at the machine terminals. It should be noted that maximum magnitudes are dependent upon the use of lightning arresters and upon the high side connections.[1]

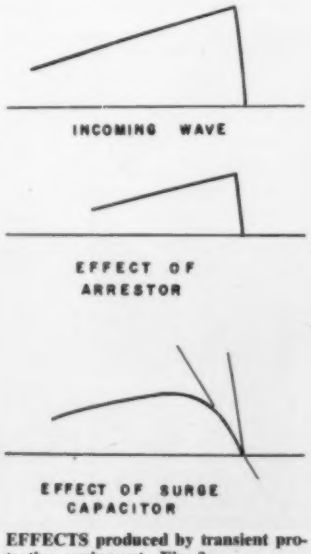
Protection of Machines—Traveling Waves

This protection can be thought of as consisting of two entirely separate problems:

- Limiting the maximum voltage to ground imposed upon the motor windings.
- Limiting the turn to turn voltage in the motor windings. (Appendix 2).

The wave approaching the motor has a maximum voltage which is reduced to an acceptable level by the use of lightning arresters connected line to ground.

The insulation of a motor between turns of the same coil is subjected to relatively small voltage differentials in normal service. The steepness of a traveling wave can instantaneously cause excessive differential voltages to exist; the magnitude of this voltage depends upon the rate of rise of voltage and the length of the motor coils. Proper protection can be provided by using a capacitor connected line to ground in parallel with the arrester. The capacitance reduces the steepness of the wave front and consequently limits the turn to turn voltage to a safer value (Fig. 3).



EFFECTS produced by transient protective equipment. Fig. 3.

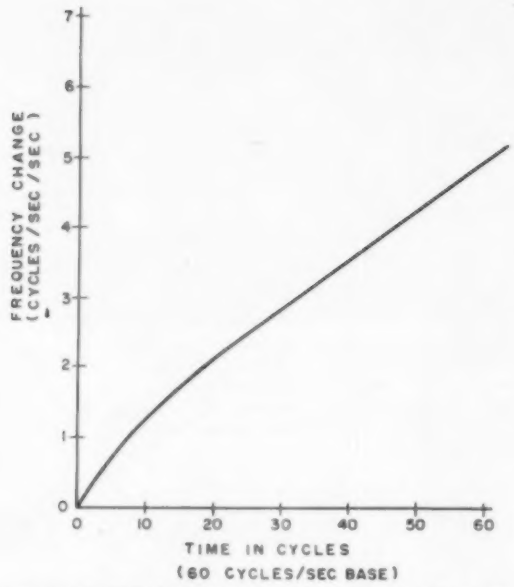
Therefore, the proper protection for a machine connected to a power system through a transformer is a surge capacitance in parallel with a lightning arrester.

The ideal location for surge capacitors and lightning arresters is at the terminals of the machine being protected. However, due to the hazardous atmosphere usually found at the machine terminals, it is not practical in the petroleum-industry applications to locate this equipment at that point.

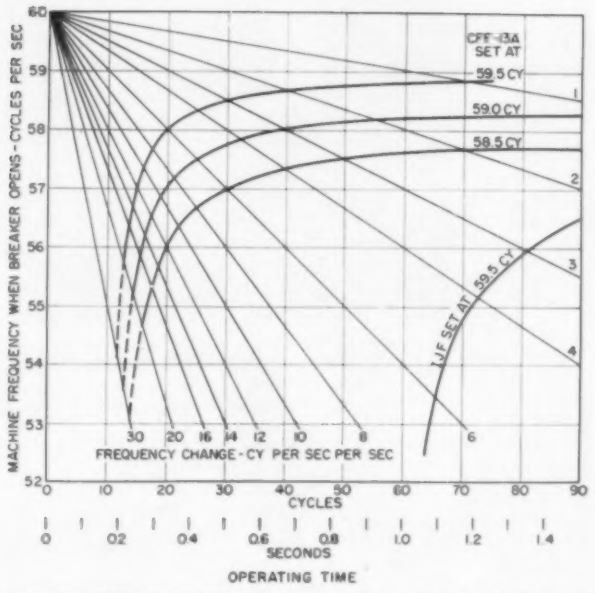
It should not be concluded, therefore, that this protection should be eliminated, since it is an essential part of the electrical protection system. The proper place under these circumstances is to locate the surge capacitor and lightning arrester on the station bus. The length of the cable connection from the bus to the lightning arrester and surge capacitor should be kept to a minimum.

Motor Transients—Torque and Current

Power interruptions of 20 cycles duration can cause undesirable transient conditions in operating motors. Interruptions of this duration can be



RATE OF FREQUENCY change is shown by this curve. Fig. 5.



UNDERFREQUENCY RELAY characteristics are plotted including total operating time. Fig. 6.

caused by instantaneous reclosing breakers on the transmission system serving the station. These undesirable transients are excessively high currents and torques which result from reapplying power out of phase with the residually generated voltage of the operating motors (Appendix 3). Factory tests have shown that magnitudes of 12 times rated line current and 20 times rated torque can be approached.

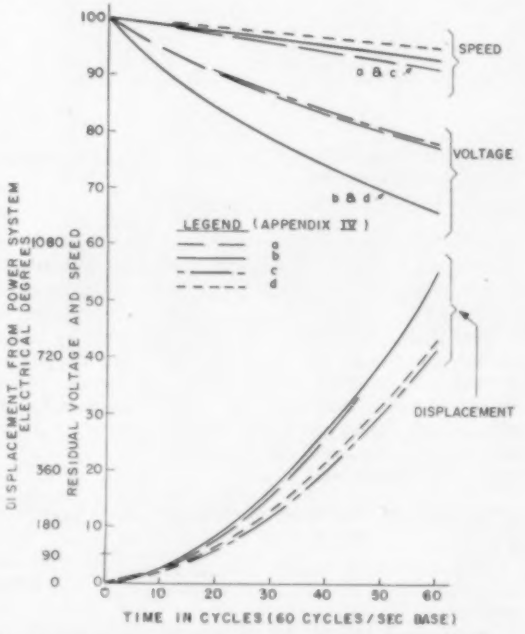
Oscillographic tests were conducted to determine the actual conditions which exist when the power is removed from an operating motor. These tests showed that the residually generated voltage decayed very slowly. The rate of change of frequency was also very low (Appendix 4).

The oscillographic tests were conducted on an actual pipeline installation, utilizing a totally enclosed, fan-cooled, explosionproof motor rated 1,250 hp., 3,600 r.p.m., 2,300 volts The motor was operating at rated speed when power was removed from the motor, and measurements were taken of the residually generated voltage and frequency, speed of the motor, and the power system frequency for use as a reference.

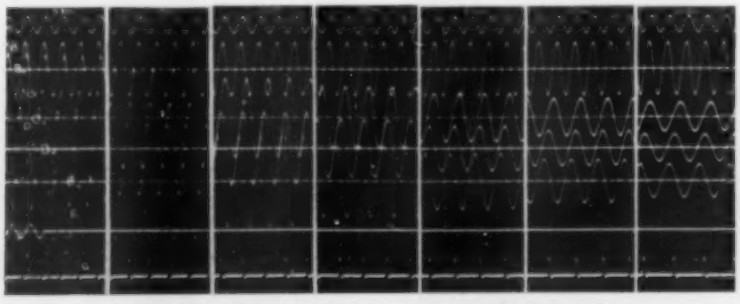
For the condition when the motor and pump are operating normally with power-factor corrective capacitors (Fig. 4), after 20 cycles of power interruption the voltage is 90 per cent of rated, the speed is 97 per cent, and the residual voltage has shifted behind the power system by approximately 145 electrical degrees. This is an undesirable situation, and power should not be reapplied under these conditions.

Although most pipeline stations have undervoltage protection with time delays of ½ to 1 second, even instantaneous undervoltage could not operate to disconnect the motor due to the high residual voltage maintained by the motors. In this case also, the rate of frequency change (Fig. 5) is so low that operation of the breaker by underfrequency relaying is also excluded (Fig. 6).

The oscillographic tests (Appendix 5) did not factor in other loads connected to the power system supplying the motors. These system effects may

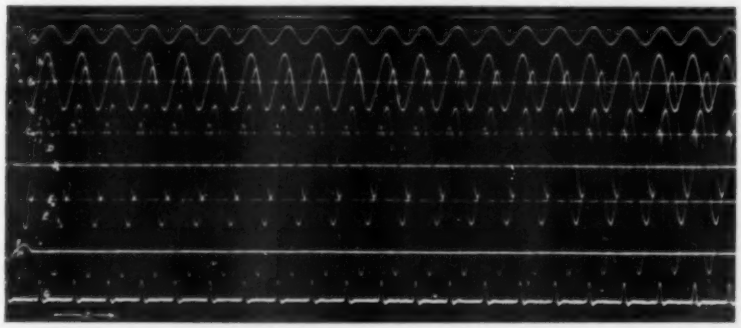


TEST RESULTS are shown for power interruption on 1,250-hp. motor. Fig. 8.

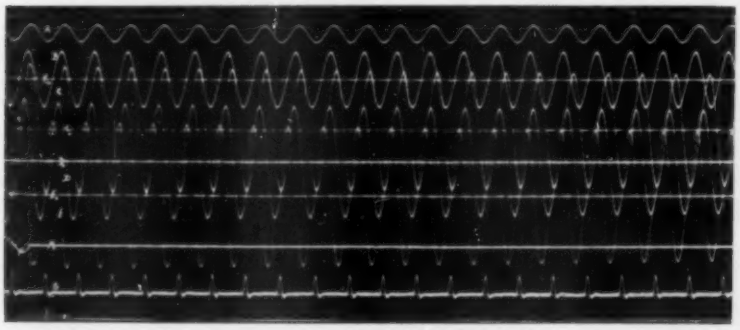


COMPOSITE OSCILLOGRAPH transient voltage decay. Fig. 7.

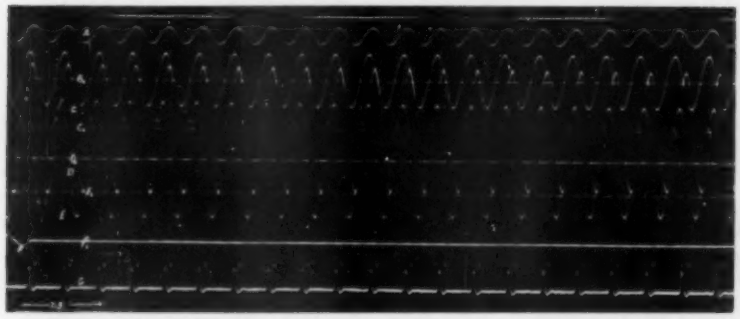
Oscillograph for 20-cycle time interval from power interruption . . . .



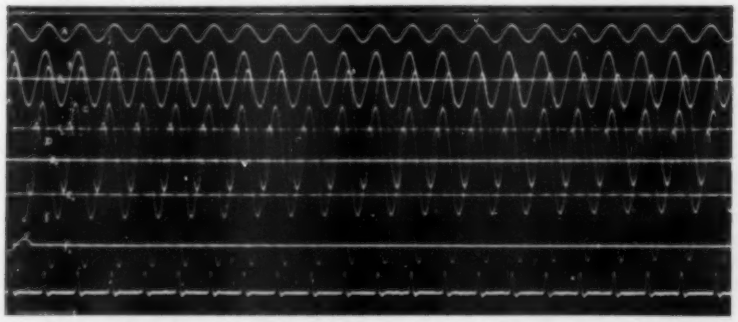
. . . with power factor corrective capacitors connected and discharge valve open. Fig. 9a.



. . . with power factor corrective capacitors disconnected and discharge valve open. Fig. 9b.



. . . with power factor corrective capacitors connected and discharge valve closed. Fig. 9c.



. . . with power factor corrective capacitors disconnected and discharge valve closed. Fig. 9d.

SN 8035946—Type K-2 pole 125 hp., 3,600 r.p.m., 2,400/4,000 volts—frame 6349 transient voltage decay test at Plantation Pipe Line Co., Doraville Station, Georgia.
180-kva. capacitors disconnected, discharge valve closed.

Curve A—60-timing valve.	
Curve B—Bus voltage (L-L)	1 mm. = 250 volts
Curve C—Motor voltage (L-L)	1 mm. = 106.4 volts
Curve D—Motor voltage (L-L)	1 mm. = 114.4 volts
Curve E—Motor voltage (L-L)	1 mm. = 92.2 volts
Curve F—Motor current	1 mm. = 54.6 amp.
Curve G—Pip indicates one revolution.	

cause more rapid decay of residual-voltage magnitude and frequency.[3] Under certain transmission line and system-loading conditions, it is also possible to obtain self-excitation of the induction motors, producing a rising voltage phenomenon.[4]

Field experience indicates that the practical considerations of power-system loading, configuration, and machine design reduce the effects which could be encountered. However, the problem is present and can occur particularly where relatively long transmission lines feed isolated one or two-unit pumping stations. Since each case requires individual evaluation, accurate generalizations are not practical.

A general solution to the problem could lie in the transmission-line relaying. Either of the following alternates appears desirable:

1. Dead line check relay to insure no objectionable residual voltage remains on the load side of the line breaker.

2. Automatic reclosing on a fixed time basis.

In the similar situation of transferring power station auxiliaries from one bus to another, the criterion is residual voltage 25 per cent rated or less. Fig. 7 is a composite oscillograph indicating that the time delay between opening of the power source until the residual decays to 25 per cent of rated may be as long as 5.5 seconds.

APPENDIX 1

The effect of multiple outgoing circuits in reducing the magnitude of reflected surge voltages is illustrated by the following table:

No. of outgoing circuits	E_2—voltage on outgoing circuits in terms of E_1—incoming voltage
0	$2E_1$
1	$1E_1$
2	$0.666E_1$
3	$0.5E_1$
4	$0.4E_1$
5	$0.333E_1$
6	$0.286E_1$

This is established by the relationship

$$E_2 = 2E_1 \frac{Z_2}{Z_1 + Z_2}$$

where:
E_1 = incoming voltage
E_2 = outgoing (refracted) voltage
Z_1 = surge impedance of incoming line
Z_2 = surge impedance of outgoing line

APPENDIX 2

Protection, Traveling Waves

For a traveling wave, localized stresses can be produced in the windings, the greatest stress occurring in the line terminal coils, the coils adjacent to the neutral end of wye connected windings, and the midpoint between terminals on delta connected windings. Due to the charging current of the capacitance between turns and from turns to slots, this charging current causes stress to exist on the line terminal coils. The dis-

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T-C Jet Strainers were designed to filter petroleum pipeline products or industrial water to any desired degree of cleanliness . . . down to 1 micron particle size (with a filteraid precoat). Without filteraid, 400-mesh screen removes all solids down to 31 micron particle size.

Push-button controls enable one man to operate an entire battery of T-C Jet Strainers. Cleaning time per strainer is less than 5 minutes. Or, these strainers may be converted to *full automatic operation* with electronic controls of the customer's choice.

Hydraulic impact, or jetting, through a rotating head within the strainer basket, quickly cleans the screen and returns the strainer to action. No back-washing.

Reasons why this high quality filtration is so low in cost:

FOR WATER-FLOODING—Removes algae, bacteria, and solids from raw water to prevent blocking face of formation, saves reworking injection wells.

Minimum investment in horsepower is required to pump water into clean formation.

Since Jet Strainers can be cleaned and returned to service in less than 5 minutes, minimum labor and time required for cleaning, or cleaning can be made fully automatic.

FOR TESTING PIPELINES—No danger of damage to pumps and meters as is the case after testing with unfiltered water. (Sediment from raw water poses a continuing maintenance problem.)

FOR PRODUCTS PIPELINES—No labor required for cleaning strainers manually;

No damage to, and subsequent replacement of, pump bearings, seals, and meters resulting from a by-passed dirty stream;

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Water coalescing beds in dehydration equipment seldom need cleaning or replacing, in contrast to dehydrators that are exposed to an unfiltered product.

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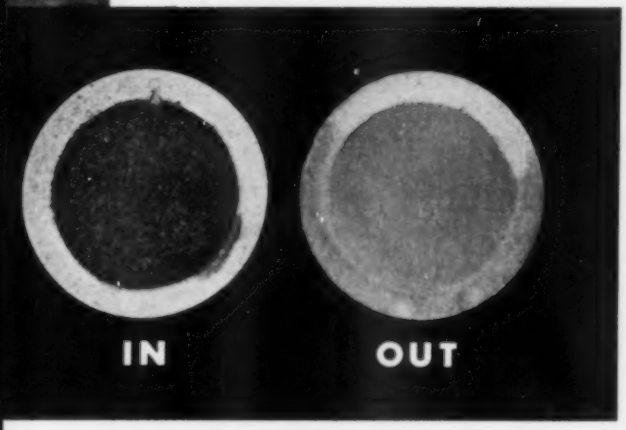
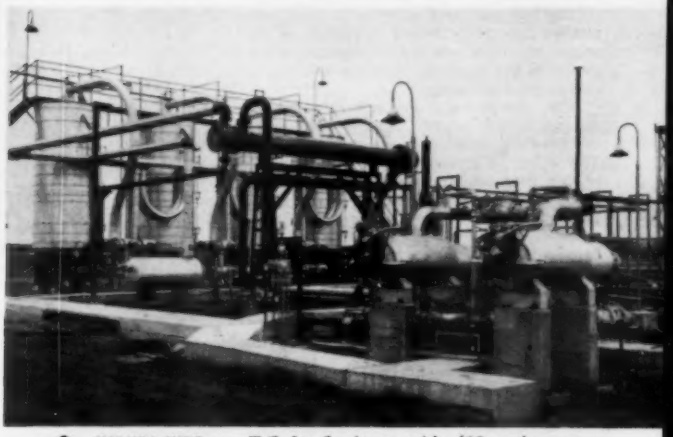
THIS BATTERY OF 900' GPM T-C JET STRAINERS is equipped with 400-mesh screens which will retain solids down to 31 micron particle size. Filteraid (diatomaceous earth), injected in the product stream, is caught on the screen and the resulting filtercake removes solids down to 1 micron particle size, as well as undissolved chemicals and precipitates.

A ROTATING CYLINDRICAL SCREEN (shown at extreme left in above picture) is used to remove the spent filteraid and dirt from the product when the Strainers are drained and cleaned.

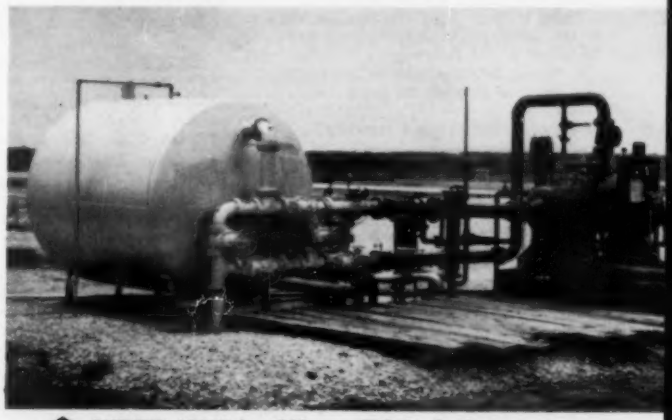


Millipore Filter Test on Jet Aircraft Fuel Graphically Demonstrates the Fine Filtration Qualities of T-C Strainers.

The two Millipore filter elements (above) contrast the cleanliness of jet aircraft fuel before and after entering a T-C Strainer. Twenty-gallon samples were taken simultaneously from the input and outlet streams. The filter element at left shows a high concentration of dirt in the input stream which, to the naked eye, showed no dirt. The filter element at right shows almost no solids remaining in the outlet stream. The Strainer was equipped with a 400-mesh screen, coated with filteraid.



SHOWN HERE are T-C Jet Strainers, with 400-mesh screens, protecting dehydration beds from contamination by removing solids and undissolved chemicals before the product enters the dehydrators.



PICTURED ABOVE is a 900 gpm T-C Jet Strainer on a water-flood project. This Strainer has five times the capacity of a conventional 8' diameter by 10' sand filter.

tribution of this voltage is not uniform, which is the reason for the line coils having the highest induced voltage.

For the condition where a traveling wave enters the machine, on one of the three phases, the maximum neutral voltage will be approximately two-thirds of the incoming line voltage due to the phenomenon of parallel surge impedances. If the incoming traveling wave enters on all three phases, the neutral voltage will be approximately double that of the incoming wave. The same condition exists for the delta connected machine, except that the doubling of voltage occurs at the midpoint of the winding.

Due to the steepness of the wave front, a voltage occurs between adjacent turns, the maximum value of which depends upon the steepness of this wave front and the electrical length of the turns involved. In order to limit the turn-to-turn voltage stresses to an acceptable value, it is necessary to control the steepness of the wave entering the machine. This is done by placing a capacitance to ground at the terminals of the machine.

In order to be most effective, the length of the connection from the line to the capacitor must always be shorter than the distance from the connecting point to the motor terminals. For maximum effect, the capacitor connection length should be kept to a minimum.

APPENDIX 3

Motor Transients

Momentary power interruptions can produce undesirable transient conditions in operating motors. The motor which is operating has considerable stored energy, both mechanical energy stored in inertia of the motor and load, and electromagnetic energy stored in the magnetic field, the mechanical energy predominating.

When the power source is interrupted, the electromagnetic energy continues to excite the machine, making it act as a generator. The effect is a residual voltage of a declining frequency related to the motor deceleration. The magnitude of voltage and its phase relation to the power system when power is reapplied determine the resulting transient conditions.

APPENDIX 4

Oscillograph Tests (Fig. 8)

Four conditions were tested, these conditions being:

1. Suction and discharge valves open with power factor corrective capacitors connected.
2. Suction and discharge valves open with capacitors disconnected.
3. Suction valve open and discharge valve closed with capacitors connected.
4. Suction valve open and discharge valve closed with capacitors disconnected.

These tests serve to evaluate, in addition to the basic power reapplication problem, the effect of the following:

1. Power factor corrective capacitors.
2. Oil flow through the pump case.

Effect of Power-Factor Corrective Capacitors

The use of power-factor corrective capacitors, although they affect the magnitude of residual voltage, does not appreciably affect the phase shift, since this is related to the deceleration of the motor (inertia constant).

Effect of Motor Load

One of the peculiarities of this type of application is the "load" carried by the machine during the deceleration. As can be seen by referring to the curves which were taken with the suction valve open and discharge valve closed, the machine decelerates at a less rapid rate than with the valves open. The increment is not appreciable. The "load" when the valves are open consists of the effect of reverse flow of fluid through the pump casing on the impeller.

When power is removed from the motor, the difference in pressure between the pump suction pressure and the pump discharge pressure must equalize. Consequently, the flow reverses, and in flowing from discharge to suction exerts a decelerating torque on the motor. The effect noted is the difference in deceleration of the motor with the valves open and with the discharge valve closed. For example, at the end of 3 seconds, speed of the pump is 78 per cent rated with the valves open and 84 per cent rated with the valves closed. During the first 20 cycles this effect is negligible.

APPENDIX 5

(Figs. 9a, 9b, 9c, and 9d.)

Acknowledgments

Plantation Pipe Line Co., for making available personnel and facilities to assist in conducting the oscillographic tests on a pump motor at its Doraville station.

P. D. Woodruff, for assistance in conducting and analyzing the oscillographic tests.

References

1. Protection of Transmission Systems Against Lightning (a book), W. W. Lewis, John Wiley & Sons, Inc., N. Y., N. Y., pp. 316-61.
2. Transients in Power Systems (a book), H. A. Peterson, John Wiley & Sons, N. Y., N. Y., pp. 126-83.
3. Transfer of Steam Electric Generating Station Auxiliary Buses, AIEE Trans. Paper 55-96, D. G. Lewis, W. D. Marsh.
4. Analysis of Series Capacitor Applications Problems, AIEE Electrical Engineering, August 1937, J. W. Butler, C. Concordia.

BOOKS

HIGHER OXO ALCOHOLS. By Lewis F. Hatch. Published by John Wiley & Sons, Inc., 440 Fourth Avenue, New York 16. 120 pp. $4.50.

This small volume on oxo alcohols covers briefly the historical development of the Fischer-Tropsch reactions. It then takes up the oxo reaction, tabulates products obtained by the oxo process from pure olefins, and deals with the reaction variables. A section is devoted to the catalyst and another section to side reactions.

The second and third chapter covers product utilization and plasticizers, respectively. Agricultural applications, detergents, and lubricants applications are some of the other uses dealt with.

ELECTRONIC CIRCUITRY FOR INSTRUMENTS AND EQUIPMENT. By Milton H. Aronson. Published by Instruments Publishing Co., 845 Ridge Avenue., Pittsburgh 12, 312 pp. Price $2.

A home-study course, this book concerns itself with basic electronic circuitry for instruments, communications, TV, laboratory apparatus, and military equipment.

A textbook technique is adopted, featuring multiple-choice questions on every section and chapter. These questions, at the rear of the book, pick out the principal points the author is trying to convey.

With 215 illustrations, 485 text items, 10 tables, and a comprehensive index, the book covers such fields as circuit elements, impedance and resonance, signals and simple circuits, vacuum tubes, gas-filled tubes, and rectification and power supplies.

Other areas covered include amplifier circuits, solid-state amplifiers, oscillator circuits, signal-shaping circuits, and scientific and industrial instruments.

One chapter is set aside for the study of military electronics.

PRINCIPLES OF THE PROPERTIES OF MATERIALS. By Jacob Porter Frankel. Published by McGraw-Hill Book Co., Inc., 330 W. Forty-Second Street, New York 36. 228 pp. $6.

This textbook on the properties of materials, aimed at engineering students, emphasizes principles and properties rather than materials.

The author explains that materials go in and out of fashion, but are always replaced by those designed on the basis of required properties. The student who understands even a few major principles has a better grasp of the materials problems of the engineer than one who has spent an equivalent amount of time in the study of metals, concrete, wood or plastics.

Each chapter opens with a synopsis in which the most important principles to be covered are stated. The body of the chapter is devoted to an exposition of the logical derivation and use of these principles. There are questions at the end of each chapter.

The book is based on a series of lecture notes at the Northwestern Technological Institute.

OFFICE AUTOMATION APPLICATIONS. By R. Hunt Brown. Published by Automation Consultants, Inc., 155 Fifth Avenue, New York 10. $37.50.

This semitechnical work, printed on 8½ by 11-in. pages in loose-leaf form to accommodate additional material, tells of the application of new machines and techniques to office automation.

"To the systems man, office automation is a technique of more fully mechanizing office procedures," the author explains. "To management, office automation is a new management tool to simplify control of business, assist in decision making, lower operation costs, and speed up service to customers."

In the volume are sections describing methods employed in the field of office automation, case studies in industrial categories, a section on new management techniques, a summary, and an exhaustive index.

Covered are methods employed for feasibility studies, equipment evaluation, personal training, physical facility factors, basic programing, and advanced coding.

The book devotes a lion's share of its pages to actual case studies, classified according to the principal industrial and government areas.

The eight divisions in the case-study section deal with manufacturing durable and nondurable goods, government, retail and wholesale trade, public utilities, finance and insurance, petroleum products, and services and other categories.

The case studies review each organization's history and products, type of investigation undertaken before selection of equipment, personnel training program, comparison of old and new systems, and related items of interest. Evaluations and analyses of tangible and intangible savings are discussed.

Note: The Oil and Gas Journal maintains a book department. Write to the READER SERVICE DEPARTMENT, P. O. Box 1260, Tulsa 1, for copies of the book list. Often books reviewed here may be purchased from this source.

Product Prices Throughout the World

By W. L. Nelson
Technical Editor

How are the prices of refinery products computed for points such as Europe or the Far East?—G.W.F.

Traditionally, prices throughout the world have been considered as Gulf Coast prices plus transportation cost from the gulf. This, of course, has little basis in the Far East which can be served much more easily from the East Indies region or even the Middle East, nor is such a basis completely valid as the Middle East is approached. Nevertheless, Gulf Coast prices continue to exert an influence which causes prices to be high throughout most of the world in relation to the cost of crude oil and the cost of refining it.

Recently posted Abadan prices indicate competition with Gulf Coast prices within the Mediterranean and this permits Abadan products to invade the Far East to about Rangoon (which is close to the East Indies). This conclusion can be checked by examination of Tables 1 and 3 which consider comparisons of prices at:

United Kingdom and North Continent, Calcutta-Rangoon range, New York.

TABLE 2—AVERAGE AND SPOT TANKER RATES USED IN COMPUTING TABLES 1 AND 3 FOR PRODUCT SHIPMENTS† DURING MAY 27-29, 1957

Average rates:	Plus or minus on USMC	—USMC rates— Basic	May 27	—Cents per barrel— Gaso.	Dist.	Fuel
Gulf-U.S.N.H.	+20	2.85	3.42	46	52	54
N.W.I.-U.S.N.H.	+20	2.70	3.24	43	49	51
Gulf-U.K.	+ 5	7.65	8.05	106	123	127
N.W.I.-U.K.	+ 5	6.55	6.87	91	105	109
Persia-U.K.	+ 5	10.90	11.43	151	175	181
Persia-Rangoon	+ 5	5.35	5.62	74	86	89
Singapore-Rangoon	+ 5	3.45	3.62	48	55	57
Spot rates:						
Gulf-U.S.N.H.	−30	2.85	1.99	27	30	31
N.W.I.-U.S.N.H.	−52.5	2.70	1.31	17	20	21
Gulf-U.K.	*0	7.65	7.65	101	117	121
N.W.I.-U.K.	0	6.55	6.55	87	100	104
Persia-U.K.	*−10	10.90	9.80	129	150	155
Persia—U.S.N.H.	−30	...	...	...	...	...
Persia-Rangoon	*−10	5.35	4.81	64	74	76
Singapore-Rangoon	*−10	3.45	3.10	41	47	49

*Used as zero and −10 although to U.K. was +217. †Fifteen per cent was added for clean shipments.

TABLE 1—ESTIMATE OF PRODUCT PRICES AT ABADAN, SINGAPORE, AND NEW YORK (USING AVERAGE TANKER RATES)
(In U. S. dollars)

	Abadan prices based on Gulf Coast prices									Abadan based on N.W.I. prices				
	Avia. gaso.	90 oct. gaso.	79 oct. gaso.	70-72 gaso.	Jet	No. 2 fuel	Diesel 48-52	Diesel 53-57	Fuel	79 oct. gaso.	70-72 gaso.	No. 2 fuel	Diesel 48-52	Fuel
Price at base point	8.07	4.82	4.25	4.20	4.40	4.20	4.30	4.35	2.75	4.25	4.10	4.20	4.25	2.55
Plus transportation to sale point	1.06	1.06	1.06	1.06	1.10	1.23	1.23	1.23	1.27	.91	.91	1.05	1.05	1.09
Price at sale point	9.13	5.88	5.31	5.26	5.50	5.43	5.53	5.58	4.02	5.16	5.01	5.25	5.30	3.64
Less transportaton from world point	1.51	1.51	1.51	1.51	1.57	1.75	1.75	1.75	1.81	1.51	1.51	1.75	1.75	1.81
At world point—computed	7.62	4.37	3.80	3.75	3.93	3.68	3.78	3.83	2.21	3.65	3.50	3.50	3.55	1.83
Actual price	7.97	4.54	3.99	3.86	4.03	3.82	3.90	3.99	2.30	3.99	3.86	3.82	3.90	2.30
Extra price at world point	.35	.17	.19	.11	.10	.14	.12	.16	.09	.34	.36	.32	.35	.47

	Singapore based on Abadan prices		New York based on Gulf Coast				New York based on N.W.I. prices			
	79 oct. gaso.	Diesel 48-52	Avia. gaso.	Kero.	No. 2 fuel	Fuel	Avia. gaso.	Kero.	No. 2 fuel	Fuel
Price at base point	3.99	3.90	7.45	4.25	4.20	2.75	7.35	4.25	4.20	2.55
Plus transportation to sale point	.74	.86	.45	.50	.52	.54	.43	.47	.49	.51
Price at sale point	4.73	4.76	7.91	4.75	4.72	3.29	7.78	4.72	4.69	3.06
Less transportaton from world point	.48	.55								
At world point—computed	4.25	4.21								
Actual price	4.51	4.56	8.33	4.92	4.68	3.10	8.33	4.92	4.68	3.10
Extra price at world point	.26	.35	.42	.17	—.04	—.19	*.55	*.20	*—.01	*.04

*Less import duty if sold in United States.

Questions on Technology (Continued)

TABLE 3—ESTIMATE OF PRODUCT PRICES AT ABADAN, SINGAPORE, AND NEW YORK (USING SPOT RATES)
(In U. S. dollars)

	Abadan prices based on Gulf Coast prices									Abadan based on N.W.I. prices				
	Avia. gaso.	90 oct. gaso.	79 oct. gaso.	70-72 gaso.	Jet fuel	No. 2 fuel	Diesel 48-52	Diesel 53-57	Fuel	79 oct. gaso.	70-72 gaso.	No. 2 fuel	Diesel 48-52	Fuel
Price at base point	8.07	4.82	4.25	4.20	4.40	4.20	4.30	4.35	2.75	4.25	4.10	4.20	4.25	2.55
Plus transportation to sale point	1.01	1.01	1.01	1.01	1.06	1.17	1.17	1.17	1.21	.87	.87	1.00	1.00	1.04
Price at sale point	9.08	5.83	5.26	5.21	5.46	5.37	5.47	5.52	3.96	5.12	4.97	5.20	5.25	3.59
Less transportaton from world point	1.29	1.29	1.29	1.29	1.35	1.50	1.50	1.50	1.55	1.29	1.29	1.50	1.50	1.50
At world point—computed	7.79	4.54	3.97	3.92	4.11	3.87	3.97	4.02	2.41	3.83	3.68	3.70	3.75	2.04
Actual price	7.97	4.54	3.99	3.86	4.03	3.82	3.90	3.99	2.30	3.99	3.86	3.82	3.90	2.30
Extra price at world point	.78		.02	—.06	—.08	—.05	—.07	—.03	—.11	.16	.18	.12	.15	.26

	Singapore based on Abadan prices		New York based on Gulf Coast				New York based on N.W.I. prices			
	79 oct. gaso.	Diesel 48-52	Avia. gaso.	Kero.	No. 2 fuel	Fuel	Avia. gaso.	Kero.	No. 2 fuel	Fuel
Price at base point	3.99	3.90	7.45	4.25	4.20	2.75	7.35	4.25	4.20	2.55
Plus transportation to sale point	.64	.74	.27	.28	.30	.31	.17	.18	.20	.21
Price at sale point	4.63	4.64	7.72	4.53	4.50	3.06	7.52	4.43	4.40	2.76
Less transportaton from world point	.41	.47								
At world point—computed	4.22	4.17								
Actual price	4.51	4.56	8.33	4.92	4.68	3.10	8.33	4.92	4.68	3.10
Extra price at world point	.29	.39	.61	.39	.18	.04	*.81	*.49	*.28	*.34

*Less import duty if sold in United States.

TABLE 4—PRODUCT PRICES (CENTS PER GALLON) DURING MAY 27-29, 1957

	Abadan	Gulf	Singapore	N.W.I.	N.Y.
Aviation gasoline—115/145	19.0	19.25			
Aviation gasoline—100/130		17.75	18.875	17.5	19.85
Gasoline—93		11.75		11.75	
Gasoline—90	10.8	11.25			
Gasoline—87		10.875		10.875	
Gasoline—79	9.5	10.125	10.75	10.125	
Gasoline—73 clear	15.5				
Gasoline—70-72	9.2	10.0		9.75	
Jet fuel	9.6	10.5			
Kerosine		10.125	11.0	10.125	11.75
No. 2 fuel	9.1	10.0		10.0	11.15
Diesel—48-52	9.3	10.25	10.875	10.125	
Diesel—53-57	9.5	10.375			
Fuel oil	2.30	2.75		2.55	3.10

The tables were based on the prices shown in Table 4 for May 27 and the transportation rates of Table 2. Spot tanker rates (Table 3) seem to support competition between Abadan and the Gulf Coast at points outside the Mediterranean whereas average tanker rates (charter, company-owned, and spot, see Questions on Technology, October 21, 1957, page 134) tend to confine the frontier of competition to the Mediterranean. Meanwhile, somewhat artificial prices were maintained on the East Coast of the United States during May because product prices are even higher than Gulf Coast prices justify.

No Formal Crude-Oil Standards

We are interested in the specifications or standards used to grade West Texas crude oils—your article of October 22, 1956, did not state the standards. Do the companies grade the oils on an individual basis or are standards set by commissions or societies? L.R.

There are no formal standards or specifications by which crude oils are classified or graded unless perhaps Pennsylvania oils are graded by a local organization.

The psychological, political, and competitive conditions that govern the purchasing of crude oils are so powerful and so complicated compared with the differences in the quality of crude oils that it is doubtful if standards or specifications will ever be adopted. In the case of West Texas crude oils we do not even have a definition of what is meant by the terms "sour" and "sweet."

Strangely enough, technical men are among the worst offenders in using such terms carelessly. The companies decide what schedule they will employ in paying for each oil and such decisions are seldom based on a consideration or knowledge of the properties of the crude oil. They are, of course, greatly influenced by what surrounding purchasers are paying.

Then too, what do you pay for an oil when say three qualities of oils are being produced on one lease (or nearby) and they are all mixed in the pipeline? Can you easily convince one landowner that his oil is different from that of his neighbor? The article of October 22, 1956, p. 133, should be reread, and an effort should be made to establish a clear meaning for the terms "sour" and "high sulfur." (Nelson, W. L., Separate Penalties for High Sulfur and Sourness, The Oil and Gas Journal, August 1, 1955, p. 117).

At Pure's Worland plant, they've found

How to Combat Corrosion of Equipment

By R. S. Birmingham

ATMOSPHERIC conditions existing in areas of sour-gas and oil production and processing usually play havoc with exposed electrical equipment and copper wiring.

It has been necessary to replace miles of copper wire in one field with aluminum as the copper wire completely deteriorated after a short period of service.

Some electrical fittings such as line connectors have been plated with 0.002 in. of tin with no corrosion experienced.

Camphor is sometimes used satisfactorily in switch boxes and switch-gear panels for corrosion prevention. The protection obtained in this fashion is probably due to a monomolecular film coating caused by camphor vapors. This type equipment has also been protected by sealing units with plastic tape.

Three-phase electric motors have been known to phaseout due to terminal lugs corroding in switch panels. Motor failures have been minimized by painting the terminal lugs with electricians' lacquer which seals out the amosphere.

Electric motors of the open type, having rotor bars silver-soldered to end rings, have failed due to the silver corroding and bars coming loose.

Electric-brazing the rotor bars to the end rings, using a low-melting-point bronze, should prevent this from happening.

Effects of Sour-Gas Flowmeters and Controllers

Generally, standard mercury meters have been found satisfactory in sour-gas measurement. Corrosion does take place in the meter-pressure shaft bearings unless plastic-sealed bearings, such as Teflon, are used.

Author is with Pure Oil Co., Worland, Wyo. Paper presented at Rocky Mountain regional meeting, Natural Gasoline Association of America, 1957.

Meters having Teflon-sealed bearings have been in service for over 3 years with no maintenance necessary.

There is some mercury contamination although not much more than that encountered in sweet-gas measurement.

Pneumatic transmitters having 316 stainless-steel measuring diaphragms and meter bodies have proved to be very satisfactory for sour-gas measurement and control purposes.

Liquid seals are seldom used, since metering and control operations can usually be accomplished without employing them. When seals are employed, it is usually necessary to clean meter leads and replace seal after approximately 90 days' service.

Liquid seals such as glycol are reacted upon by hydrogen sulfide, causing sludging. Metering results are then erroneous. Dibutyl phthalate will absorb hydrogen sulfide and then deposit it as free sulfur in meter leads, thus effecting metering accuracy.

All meters, transmitters, and controller assemblies that are subpect to corrosion have been protected by painting with a Duco lacquer. Equipment protected in this manner has not shown signs of corrosion or malfunction after 5 years of service.

No. 316 stainless-steel has proved very satisfactory for all sour-service-control valve trim, meter, and controller elements. No. 304 stainless-steel was found to be generally unsatisfactory and its use soon discontinued.

Meter and controller-clock corrosion can be reduced to minimum by an air purge into meter cases that are installed in sour atmosphere.

Hydrate formation in sour-gas-meter leads is a common occurrence, and can be prevented by heating the leads, insulating, and housing.

Degradation of Monoethanolamine

Operators of Girbotol units in this region were among the first to experience problem of monoethanolamine degradation.

The capacity of amine solutions declined even though results of control test, a simple sulfuric-acid titration, indicated the available amine content to be higher than expected.

Degradation products . . . As a result of the research done by Union Carbide Chemical Co. (formerly Carbide & Carbon Chemical Co.), two contamination products were isolated, imidazolidone-2 and ethylene diamine. Monoethanolamine can be converted to these compounds by heating its carbonate salt to temperatures equivalent to those encountered in acid-gas-removal plants.

Imidazolidone-2 . . . This contributes no acid-gas absorption capacity to the solution. Ethylene diamine does have absorption capacity; however, since it is a stronger base than monoethanolamine, its sulfide and carbonate salts are more difficult to regenerate. The presence of this stronger base compound is the reason for amine-solution tests indicating higher available monoethanolamine content than is actually available. The conversion-products formation can be expected where carbon dioxide is present and higher regeneration temperatures are employed.

Slip stream distillation is employed for amine-degradation-product removal.[1] Conversion products and other undesirable byproducts are drawn from the still reboiler and are hauled to an earthen pit outside immediate plant area for disposal.

Reference

1. Polderman, L. D., Dillon, C. P.: "Degradation of Monoethanolamine in Natural Gas Treating Service," reprinted from The Oil and Gas Journal, issue of May 16, 1955.

Here is operation of

Flushing Systems and Couplings

Flushing systems . . . There are three general types of flushing systems—self-flushing, external flushing, and seal oil. If the liquid being pumped is clean and cool a self-flushing system is used. The liquid being pumped is recirculated from the pump discharge into the stuffing box and back into the pump suction. (See Fig. 16)

If it is possible for any foreign material to get into the liquid, a strainer is installed in the flushing line. The restriction orifice shown in the flushing line in Fig. 16 is intended to reduce the loss of liquid in case the mechanical seal or the retaining gland fails. Some pumps are furnished with a built-in system, so no external piping is required.

External flushing systems are used when the pumped liquid is very hot, contains solid material, or is highly corrosive. Some other clean, cool oil with proper characteristics is used for flushing in this case. It is stored near the pump and is pumped into the stuffing box at a pressure somewhat higher than pump suction pressure. This keeps the liquid handled by the pump from entering the pump stuffing box.

The purpose of the seal-oil system is not primarily flushing. Its purpose is to serve as a seal to prevent the liquid being pumped from getting between the seal faces or escaping to the atmosphere. Seal-oil systems are usually used on pumps with double mechanical seals or may be used when the fluid being pumped is very erosive or corrosive.

It is also used on some of the more modern pumps which have built-in mechanical seals as well as auxiliary packing. In this case, the seal oil is introduced between the seal and the packing.

Couplings

Many types of couplings are now being produced for use with various types of rotating equipment. In this topic we will consider only the flexible couplings usually furnished with centrifugal pumps.

Purposes . . . The coupling serves a number of purposes.

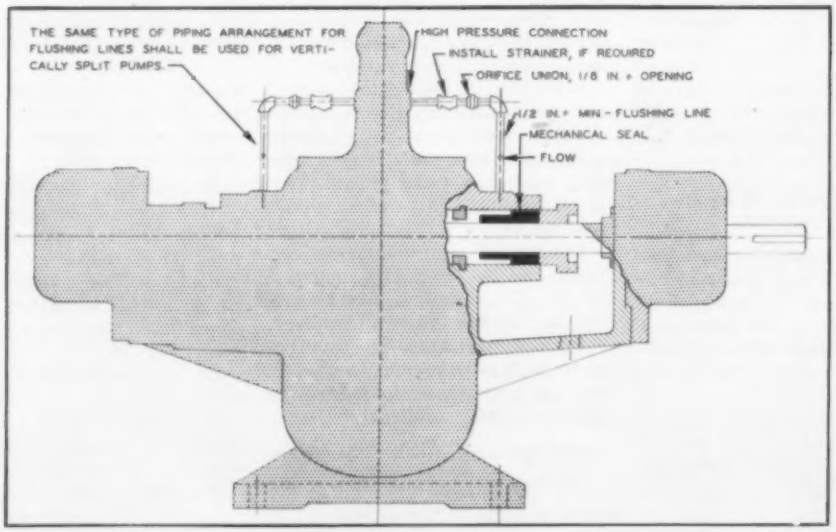
- It compensates for a small amount of misalignment between the pump and driver.
- Either the pump or the motor may be removed from the foundation without disturbing the other.
- The coupling reduces the vibration carried down the shaft from one unit to the other and reduces any shock load which may suddenly develop.
- When used with a spacer between the two halves of the coupling, it is possible to reach the internal parts of most single-suction centrifugal pumps without disturbing the motor or the piping.

All of the couplings now being used in the refinery are similar.

Lubrication . . . At the time the flexible couplings are assembled, they are also properly lubricated by the mechanical personnel and will operate for very long periods without added lubrication.

When you are operating equipment having the flexible couplings, be sure to watch for signs of leakage. These couplings should not leak. In the event you observe leakage, take steps to have the condition corrected.

This material taken from process-training-program manual, Baton Rouge, La., refinery of Esso-Standard Oil Co.


THE SAME TYPE OF PIPING ARRANGEMENT FOR FLUSHING LINES SHALL BE USED FOR VERTICALLY SPLIT PUMPS.
HIGH PRESSURE CONNECTION
INSTALL STRAINER, IF REQUIRED
ORIFICE UNION, 1/8 IN. OPENING
1/2 IN. MIN. FLUSHING LINE
MECHANICAL SEAL
FLOW

STANDARD installation of flushing lines on centrifugal pumps with mechanical seals. (Fig. 16).

(Part 1)

In Arabian refineries . . .

The REFINER'S NOTEBOOK

Here's How Flame Photometric Method

shows salt content in crude oil

By K. G. Stoffer

THE SALT CONTENT of Arabian crude oil can be determined rapidly and directly without prior extraction by means of a flame spectrophotometer.

- The method translates sodium ion content into salt content, and therefore depends on the ratio of sodium to total salts in the aquifer of the production zones.
- Working curves are constructed for each producing area by plotting luminosity of the sodium flame vs. salt content of the crude as determined by an aqueous-extraction procedure.
- The method is quite useful in monitoring plant charging stock and individual wells with a minimum number of personnel. Salt values obtained compare favorably with those obtained by routine aqueous-extraction procedures.

Salts In Crude Oil

Crude oils often contain inorganic salts, particularly the chlorides and sulfates of sodium, magnesium, and calcium which contribute to acid corrosion of equipment and fouling in stabilizing and refining processes. Control of these difficulties is based on monitoring the salt content of charging stocks through the determination of their chloride content.

This frequent checking of the salt content of refinery and stabilizer charging stocks, and periodic checking of individual wells supplying these plants, result in a large number of these analyses being conducted by laboratories responsible for this work.

Aqueous extraction . . . A procedure involving aqueous extraction of the salt from the crude oil for subsequent chloride determination is a time-consuming operation whether the extraction is accomplished by means of a separatory funnel with manual agitation, or a resistance-heated refluxing apparatus.

Both the separatory-funnel method[1] and the resistance-heated TEL extraction procedure[2] are commonly used in control laboratories of the petroleum industry. The separatory-funnel method, while widely used, can be particularly time consuming because of the high oil-water emulsions that are frequently encountered during the extraction process.

An emulsion-breaking agent is usually added in such cases to speed separation of the water and oil phases. Determination of the chloride (salt) content of the extracts is commonly done by the Mohr or Volhard methods.

Potentiometric . . . Another method[3] determines the chloride content of the crude oil potentiometrically, using an alcoholic silver nitrate solution.

In any volumetric method for determining salt in sour crudes the hydrogen sulfide must be removed from aqueuos extracts, or otherwise taken into account before titrating the chlorides. Mercaptans also must be destroyed before proceeding with the chloride titration. The present flame-photometric method suffers from neither of these interferences.

Another advantage of the method described here is that only one chemical solution is required (a standard NaCl solution) as compared to at least seven (including two standard solutions) required for extraction procedures.

Conditions for Flame Determination

The instrument used in this study was the Beckman Model B Spectrophotometer with No. 9125 flame attachment and No. 4600 photomultiplier unit. The method of sample entry into the oxyhydrogen flame is ideal for this application. The sample, cut 50-50 with benzene, is aspirated directly into the flame, as in the analysis of aqueous solutions, without prior atomization in a separate chamber. Any fire hazard, therefore, due to handling the flammable oil-benzene mixture is held to a minimum.

Optimum flame conditions . . . These required a hydrogen pressure of 2 psig. and an oxygen pressure of 9 psig.—more oxygen than is normally required in analyses of aqueous solutions. The flame produced at these pressures is quite hot, and, when the crude oil-benzene mixture is introduced, it is larger than that normally used in flame photometry—reaching into the protective grill around the opening in the top of the flame chamber.

For this reason, and to protect the burner itself from possible damage due to excessive heat, the sample is permitted to aspirate into the flame a minimum amount of time for the instrument to stabilize to a good luminosity reading, usually only 4 or 5 seconds.

"Zero salt" readings . . . Experience shows it is best to determine by actual test the luminosity reading below which the salt content of the crude oil is found to be zero by the extraction procedures. Since these zero-salt readings are quite low, it is best in these cases to make appropriate changes in the instrument sensitivity in order to get wider scale readings.

References

1. Universal Oil Products Co., Handbook—"Laboratory Test Methods for Petroleum and its Products," Method No. A-22, 1953.
2. The Institute of Petroleum, Standard Methods for Testing Petroleum and its Products, Method IP 77.
3. Dickey, R. E., and Sorg, I. V., "The Determination of Inorganic Chlorides in Crude Oils by Direct Electrometric Titration," Petroleum Refiner 27, No. 11 (November 1948), pp. 598-602.

Author is chemist with Arabian American Oil Co. at Dhahran, Saudi Arabia.

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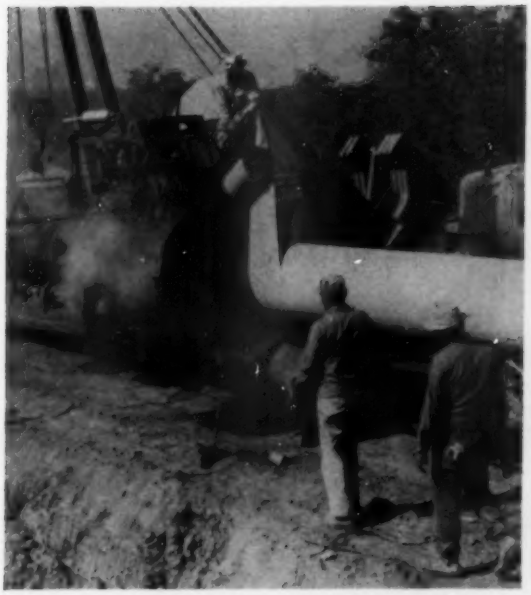

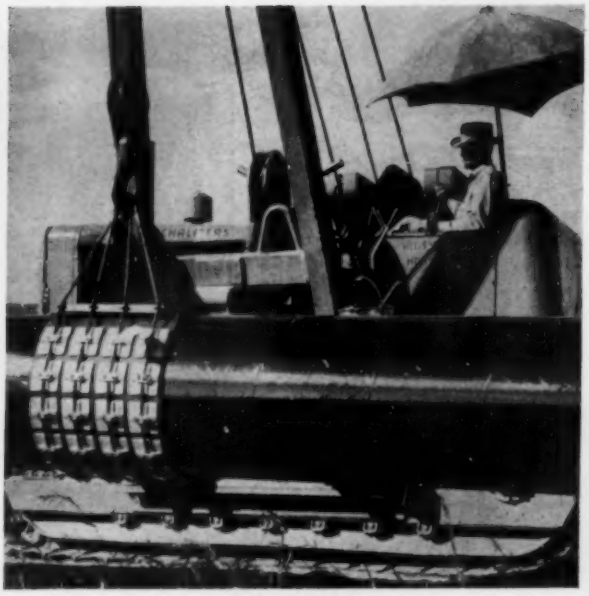

ASPHALT COATING (left) and coal-tar coating were used with glass mat for reinforcement.

How NGP Hot-Coats Pipe

On its Texas-Oklahoma transmission line

By Paul Reed
Pipeline Editor

THE PRINCIPAL hot-coating applications on the main transmission line of Natural Gas Pipeline Co. of America's current Texas-Oklahoma project are those for Schedule 2, contracted by H. B. Zachry, and Schedules 3 and 4, contracted by River Construction Co.

Asphalt coating of the pipe and the large amount of rock to be ditched are the principal features of Schedule 2 section—87 miles of 26-in. pipe between Healdton and Mountain View, Okla.—on NGP's Bridgeport - Fritch, Tex., project.

The asphalt coating is applied about 3/32 in. thick with glass mat imbedded as nearly as possible in the center of the coating. An outside wrapping of kraft paper holds the coating in place and prevents sagging. By reflecting sunlight the outer wrap keeps temperature down while pipe is standing on skids during the day.

Kettle temperature is 500° F.—higher than is usual for coal tar applied in warm weather.

Primer applied by the cleaning and priming machine ahead of coating dries in the fast time of 7 to 8 minutes.

After coating is applied by traveling-type coating-and-wrapping machine, pipe rests on skids until lowering in the following day.

Application operations have gone along smoothly. Dope crews like the asphalt coating because asphalt fumes do not burn the skin.

Tests applied to asphalt coating in the last 2 years by NGP's engineers have convinced them that it is a competitive pipe-protection material. The company has been extending its use of asphalt because of the price advantage which means that material and application costs are less than those of the other two protection materials of the Bridgeport-Fritch project — the plastic - tape and coal - tar types.

Before this section was bid by contractors, the Zachry company drilled test holes along the route. The Zachry bid was the only one made for the Bridgeport - Fritch project without a rock clause. After ditching was well under way it was discovered that Schedule 2 contracted by Zachry has more rock than the other sections.

Ditch for the 26-in. pipe is 72 in. deep and 41 in. wide.

Each of the two large ditching machines on the job digs about 5,000 ft. per day across favorable terrain.

Schedule 4

The coal-tar-coated section of the project is being laid across part of the Texas Panhandle. This 87-mile, 26-in. section, designated as Schedule 4, and contracted by River Construction Co. extends from Wheeler, Tex., to the company's Fritch, Tex., compressor station.

This is the only section of the Bridgeport - Fritch 360 - mile project

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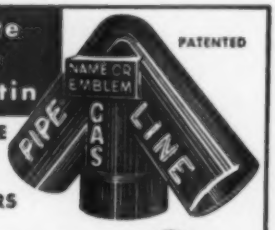

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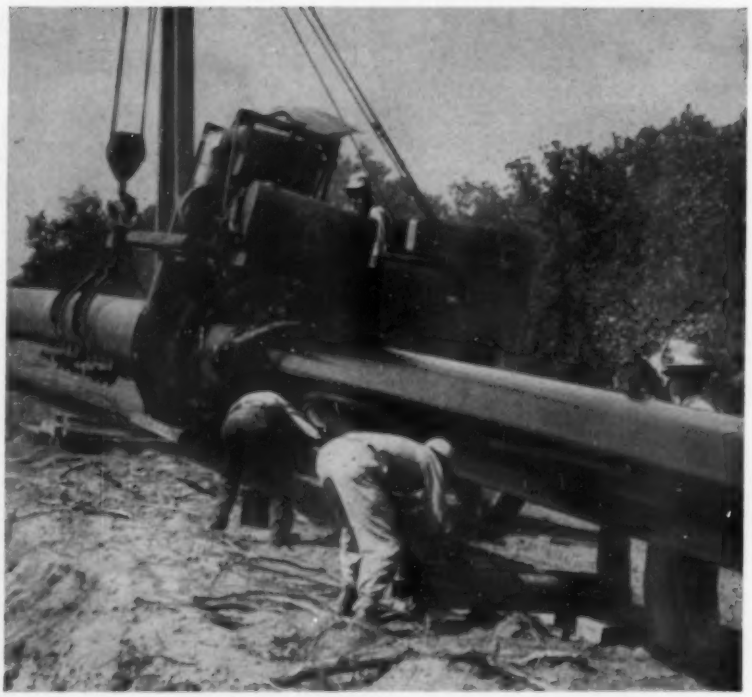


SETTING SKIDS and patching primer ahead of asphalt coating.

coated with coal tar, the long-established standard coating of the company. The other sections are protected with either asphalt or plastic tape.

Standard procedures are being used for the coal-tar-coating operation. Kettle temperature for the coal tar has been maintained at 475° F. at normal fall atmospheric temperature, 500° F. in cold weather and 450° in hot. Average coating thickness is 3/32 in., with a minimum thickness of 1/16 in. Glass mat is pulled in the hot coal tar—as near the center as possible.

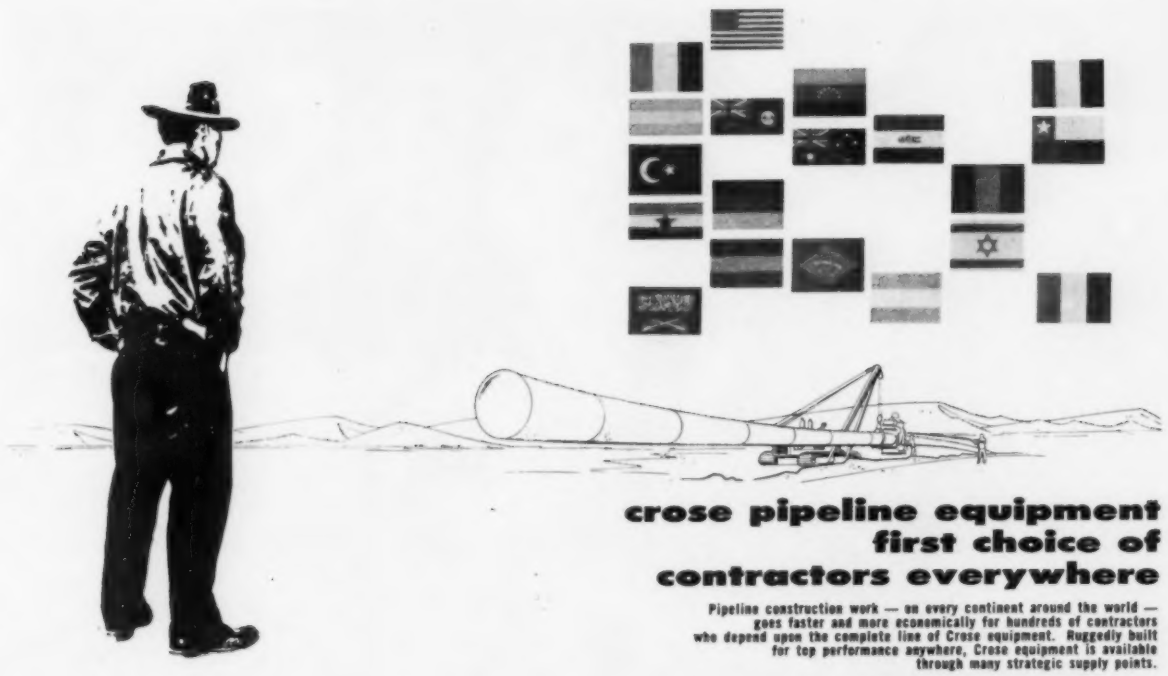
The four 25-bbl. kettles are all mounted on tractor tracks. Enamel is chopped up at a point near the railroad. During the night, fires under the kettles are tended by a fireman. Early in the morning, the kettles are spotted at 2,500-ft. intervals along the right-of-way where they are available for serving the coating operations.

The cleaning-and-priming machine operates 200 yards ahead of the coating machine. The dry primer is dusted off just ahead of the coating and wrapping machine.

Coal-Tar Application

Hot coal tar is applied uniformly by a type of machine having an insulated spray-ring applicator. The spray ring does not drag on the primed pipe but clears it by approximately 1½ in. Coating material is sprayed against a circular baffle which

CRIBBING OF SKIDS supporting pipe.



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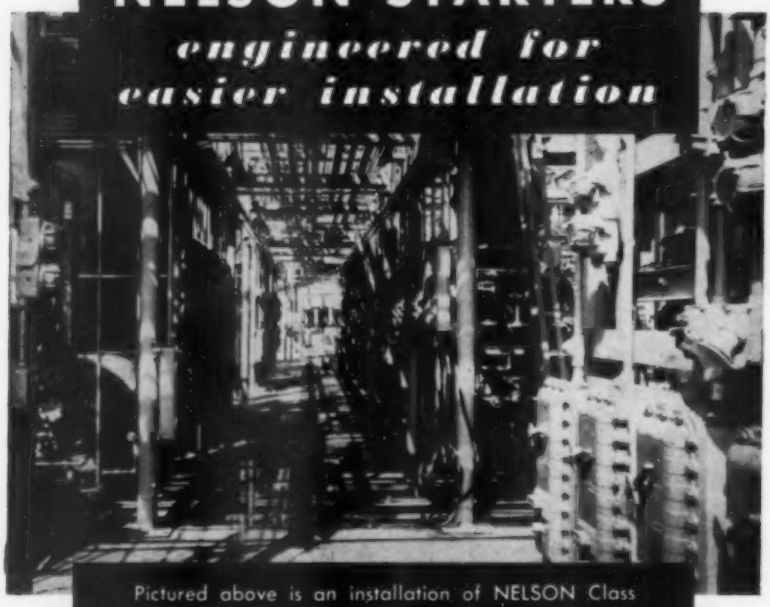

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HOLIDAY DETECTOR running over kraft-paper wrap on asphalt coating.

deflects the stream of coal tar so that it contacts the pipe at an angle which helps eliminate air bubbles in the coating.

There is a total of 40 men, 3 boom tractors, and 1 tow tractor engaged in this spread for all the operations connected with cleaning, priming, coating, wrapping, and the loading and handling of the tar kettles.

The fastest time made by the coating gang was 10,300 ft. in 5½ hours in 1 day.

There is no outside wrap.

After coating, the line is laid on skids for lowering into the ditch the following day. Before lowering in, a holiday detector is run over the pipe both before and after patching in accordance with usual pipeline practice. In lowering in, four boom tractors are used.

Welding

The welding gangs have both single-hand welders and rig welders.

The pipe gang has three stringer-bead welders and four hot-pass welders, all served by contractor-owned, diesel-driven welding machines—300-amp. type for stringer bead and 250-amp. for hot pass.

Firing-line welders come with their own 200-amp. gasoline engine-driven welding machines. There are four utility welders.

Welds at road crossings are all "soaped" for leak testing with a glycerin preparation which does not affect the pipe so as to interfere with the application of the primer preceding coating application. Bubbles in the glycerin preparation appear during an air-pressure test.

Ditching

The ditch is 42 in. wide with 42-in. cover for normal ground and 5-ft. cover in gullies and small-stream crossings.

Right-of-way bought is 60 to 75 ft., of which 50 ft. is cleared for the work.

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Among the Drilling Contractors

Scooter's Drilling Service, Shreveport, has contracted for a Tuscaloosa test to be drilled for A. J. Hodges Industries, Inc., also of Shreveport, at a wildcat location 3 miles east of Harrisonburg, in Catahoula Parish, eastern Louisiana. Location is for 2 Louisiana Central, in 9-9n-7e. It is about 2 miles east of production of Harrisonburg field. Operators expect to take the hole to about 8,800 ft.

Gilbreath Drilling Co., Kenedy, Tex., is drilling for Miller & Pierce, of San Antonio, at a wildcat location 2 miles north of Papalote, in southern Bee County, in the lower Texas coastal area. It is a 5,500-ft. test at 1 Dave Quintero, in the James Douglas Survey.

Sunnyland Contracting Co., Rayne, La., is drilling on a new 5,500-ft. contract job 3 miles northwest of Jonesville, in Catahoula Parish, eastern Louisiana. It is a Wilcox test for Walter W. Heard, Jr., and A. C. Gauthier, Jr., at 1 Alexander-Corley unit. Location, in 21-8n-6e, is about 3 miles southwest of Patton Church field, nearest production.

Fleet Drilling Co., Ada, Okla., is getting started on another Gulf Oil Corp. wildcat in northwestern Arkansas. It is a 6,500-ft. Hale test in the Spadra area, 4½ miles south of Clarksville, in northern Logan County. Location is listed as 1 Arkansas Real Estate Co., in 32-9n-23w. It is 9 miles northwest of Gulf's recently completed discovery well of Knoxville field, and 1½ miles southeast of a now-abandoned small gas-discovery well drilled in 1954. It is about 50 miles east of Fort Smith.

Penrod Drilling Co., Shreveport, has a new wildcat operation going in the LaRose area, 25 miles down Bayou Lafourche from Raceland, in Lafourche Parish, southeastern Louisiana. It is drilling on contract for Placid Oil Co., an affiliated producing company. Its location is at 1 Lake, in 43-17s-21e, about 2 miles from LaRose production. This is 12,000-ft. drilling.

Gordon Drilling Co., Mount Pleasant, Mich., has a new rotary operation at a rank wildcat location in Cheboygan County, in the tip of Michigan's Lower Peninsula. It is a contract job for Paul Ginsberg at 1 Brown, in 1-34n-2w. A Niagaran-Salina test is planned with objective about 3,850 ft.

Casey & Montgomery, Bakersfield, Calif., are scheduled for another Lower Stevens well for Universal Consolidated Oil Co. in the Gosford area, southern Kern County, California. It

R & M WELL SERVICING CO., Houston, has been keeping a rig busy in the new deep development on the north flank of the old Orange dome, in Orange County, Texas Gulf Coast. Shown on one of its recent contract jobs are: Back row, left to right, Milton Blinca, tool pusher; A. H. Massey, driller; R. T. Whitton, derrickman; H. D. Weaver, motorman; J. R. Hailman and A. C. Gough, floormen; Herbert Almond, drilling superintendent; and (front row, same order) Geneos Pete Cokinos, senior engineer, Texas Railroad Commission; Jim Adams, petroleum engineer for Milton M. Cooke, consultant, Houston; and D. B. Barns, tester for Johnston Testers, Inc.

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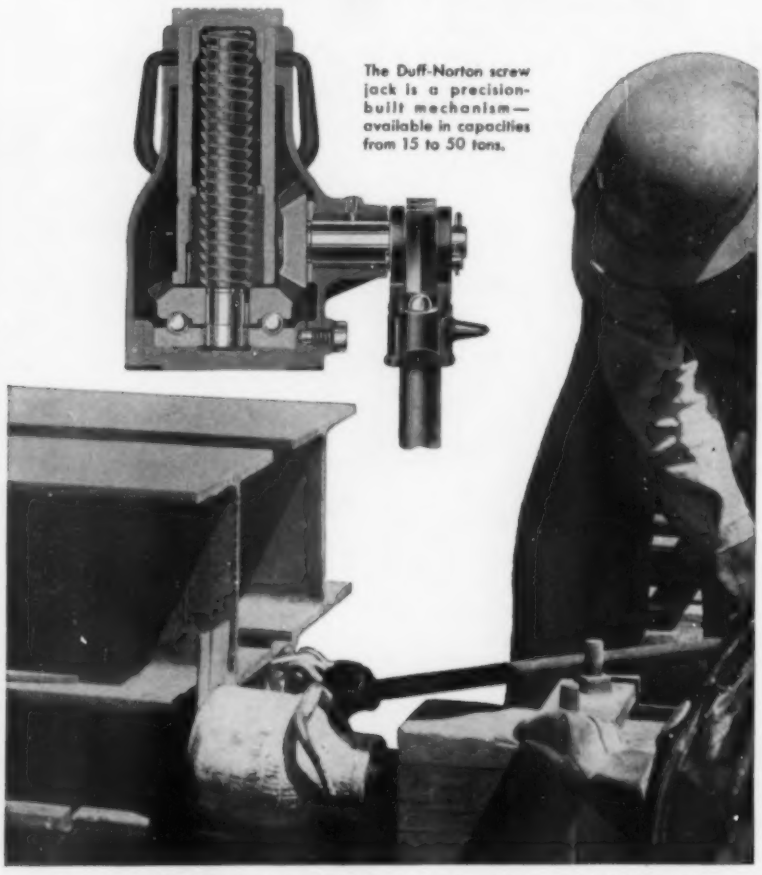

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wi.l be the operator's fourth well in that pool. Location, on the operator's State-KCL lease, is northeast of its third well, now being completed at total depth of 9,900 ft.

Oil Corp., Corpus Christi, is drilling for Coloma Oil & Gas Corp. at a wildcat location 2½ miles east of Sinton, in San Patricio County, South Texas. Location is at 1 Broughton, in Lot 1, Section 2, Coleman-Fulton Pasture Subdivision. It is a 7,500-ft. test. It is east of the one-well Broughton gas field.

Nicklos Drilling Co., Houston, has a new contract operation scheduled in the Theall area, of Vermilion Parish, Coastal Louisiana. It will be a 13,500-test for Robert Mosbacher, Harry Hurt, and Union Oil Co. of California at 1 Louisiana Furs, in 14-14s-2e. Location is about 2½ miles south of production.

A. W. Williams Drilling Co., Mobile, Ala., has a rig running on a wildcat location about 3 miles east of Sandersville field, northeast of Laurel, in Jones County, eastern Mississippi. It is a 5,600-ft. Eutaw test for Homer Best, Jr., and Hilton L. Ladner at 1 Clark, in 35-10n-10w.

Maxwell - Herring Drilling Corp., Kilgore, Tex., has a rig working for Sohio Petroleum Co. at a wildcat location 2 miles east of Geneva, in northern Sabine County, East Texas. It is a 6,500-ft. test to the Glen Rose at 1 Wilson, in the south part of the David Hoffman Survey.

Carnes W. Weaver Drilling Co., Houston, is under contract to Robert Mosbacher, of Houston, for a 11,500-ft. test at a wildcat location about a mile west of production at Cameron, in the coastal marsh area below Calcasieu Lake, Cameron Parish, Louisiana. Location is for 1 Abel West, in 35-14s-10w.

Bateman Drilling Co., New Orleans, has a new operation scheduled for Republic Natural Gas Co. in the Raceland area, Lafourche Parish, southeastern Louisiana. It will be Republic's 1-B South Shore, in 6-16s-19e. Contract is for 12,000 ft.

Green & Dreblow Drilling Co., Bakersfield, Calif., is drilling on a newly started contract operation at the northern end of the large Riverdale field, in Fresno County, California. Drilling is for Ferguson & Bosworth, with Kalpure Oil Co. as joint operator. Plans call for a 7,100-ft. well. Location is in 9-17-19.

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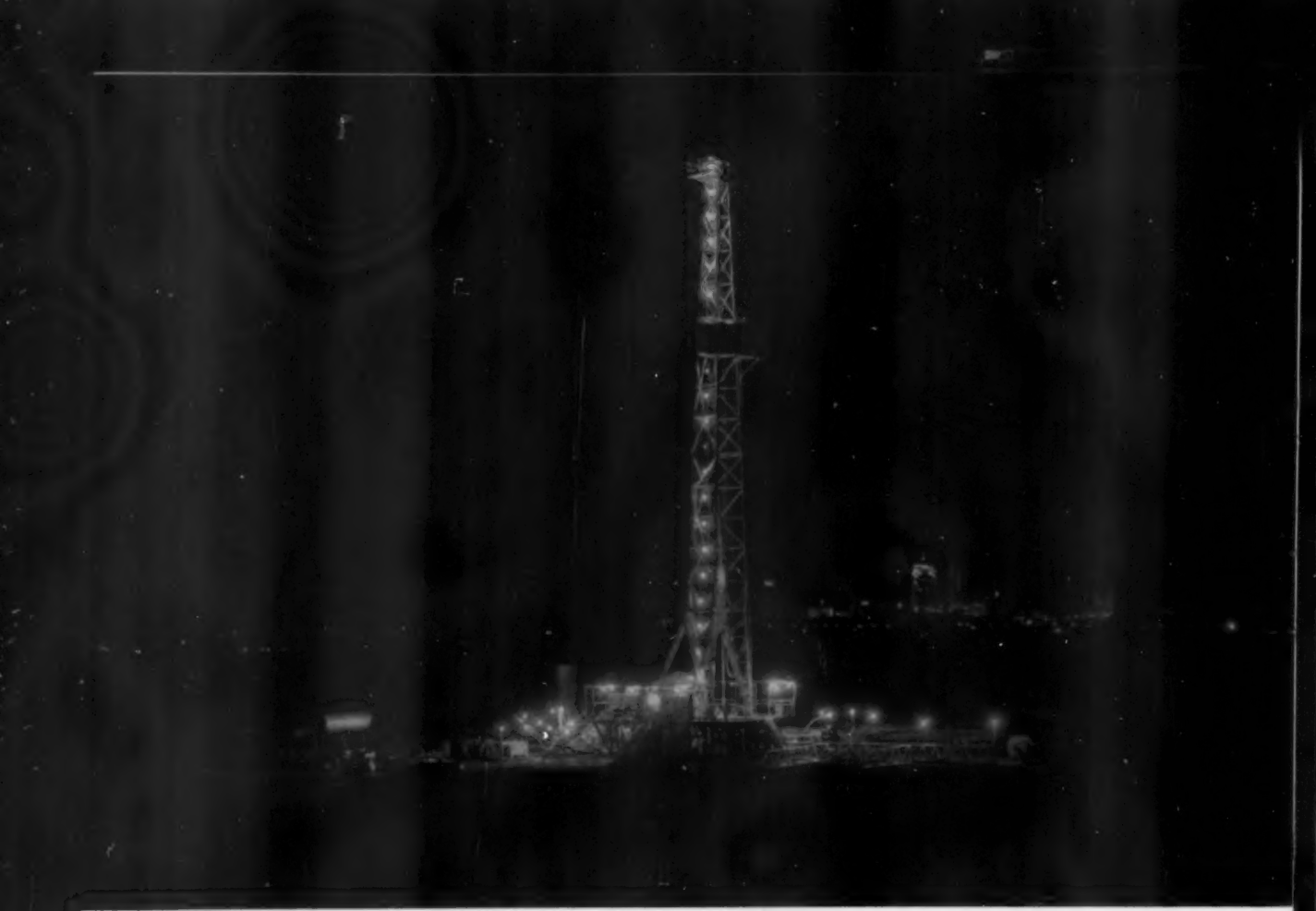
PI-2



Around the clock at Glover #1, drilling by the Nuckolls-Bell Drilling Company in the Oklahoma City field continues toward pay sand 6500 feet below surface. String of 4½" Grade D Pittsburgh Seamless drill pipe helps to drive to completion quickly, efficiently. Even at night, drilling crew knows that nearby Pittsburgh independent distributor will help out in emergency to keep rig running.

Born of the Oil Boom

Good service is natural to this Pittsburgh Steel distributor with three generations of field experience

Good service from this Pittsburgh Steel independent distributor is a family habit that started back around the turn of the century when a young blacksmith pounded out crude drilling tools for a supply house during the oil boom in the Oil City area.

Drillers of that day were constantly experimenting—devising a wide variety of tools to meet ever-changing conditions. Quickly, this man, who later founded his own independent supply company, learned to cater to the whims of these drillers and to make the tools they wanted when they wanted them.

As the search for oil moved steadily West—out of Pennsylvania into West Virginia and Ohio—across Illinois and Kansas—on to Oklahoma and Texas—the blacksmith and his family, which included four sons, followed.

The father continued to produce the tools needed by the oil men.

Eventually, the father and sons started their own supply business—opened their first store in 1926.

Past experience, their close everyday association with the needs of the booming oil industry, plus a desire to serve their friends, brought them recognition as leading suppliers of oil field production equipment.

Being independent, they could choose to handle only the best—which is why they picked Pittsburgh Steel Company seamless drill pipe, casing and tubing as an important part of their line.

One of their district managers, Wayne G. Wallace, says, "That decision to supply Pittsburgh Seamless to our customers has paid off—has helped maintain our reputation for handling quality material. I've sold thousands of feet of Pittsburgh drill pipe, for instance, and never had a minute's trouble. Everybody seems to be exceptionally well pleased."

At the rig Wayne G. Wallace, distributor's district manager, talks over Pittsburgh drill pipe performance with driller Clifford A. Funk. Daily contact like this enables distributor's field force of more than thirty men, plus another seventy in stores and offices to anticipate and furnish needed items promptly. Stores are linked with teletype system to provide maximum flexibility and service.

Following through on drill pipe order, Wayne Wallace makes sure that correct number of drill pipe lengths have tool joints flash welded to pipe as specified. Service such as this has built strong customer loyalty to his firm—even in distant lands. To Jamaica in the British West Indies, this distributor shipped a 7500-foot string of Pittsburgh 3½" Grade D Seamless drill pipe and other production items on a rush order.

The policy of handling quality products at competitive prices—the flexibility of their service—the lack of red tape—their interest in community affairs are typical of the Pittsburgh Independent Distributors listed at the right. They are on the job day and night servicing the operators from a total of 140 stores.

In the case of this particular distributor, the soundness of the founder's independent policy enabled the company to multiply its original store nine-fold. Now sons and grandsons operate two stores in New Mexico, three in Oklahoma, three in Texas and one in Cortez, Colorado; plus offices in Fort Worth, Dallas and Midland, Texas; Denver, Colorado; Tulsa and Oklahoma City, Oklahoma.

Through these offices and stores, the family continues building its tradition of service to the oil industry—a tradition founded on years of experience plus a determination to supply the best materials on time.

It will pay you in service and quality goods to deal with the Pittsburgh Independent Distributors listed here. For your next string of drill pipe, casing or tubing get the pipe of your choice from the supplier of your choice. Specify Pittsburgh Seamless.

Distributor Home Offices

Bradford Supply Company
130 Main Street
Bradford, Pennsylvania

Buckeye Supply Company
18 Harrison Street
Zanesville, Ohio

C. W. Cotton Supply Company
Utica National Bank Building
Tulsa 5, Oklahoma

Franklin Supply Company
624 South Michigan Avenue
Chicago 5, Illinois

Houston Oil Field Material Co.
1524 Maury Street
Houston, Texas

Industrial Supply Company
500 Eighth Street
Wichita Falls, Texas

Iverson Supply Company
400 West Fifth Street
Tulsa, Oklahoma

Lucey Export Corporation
233 Broadway
New York 7, New York

Lucey Products Corporation
624 South Cheyenne
Tulsa 19, Oklahoma

McJunkin Corporation
P. O. Box 513
Charleston 22, West Virginia

Midland Supply Company
Box 3105
Washington St. Station
Wichita 7, Kansas

Mountain Iron & Supply Co.
100 Rule Building
Wichita 2, Kansas

Murray Brooks, Incorporated
P. O. Box 855
Lake Charles, Louisiana

The Producers Supply & Tool Co.
706 Commercial Standard Bldg.
Fort Worth 2, Texas

Rodman Supply Company
P. O. Box 591
Odessa, Texas

Southwest Supply Company
1720 Oliver Building
Pittsburgh, Pennsylvania

Superior Iron Works & Supply Co.
P. O. Box 1800
Shreveport, Louisiana

Western Supply Company
424 North Boulder Avenue
Tulsa 1, Oklahoma

Pittsburgh Steel Company

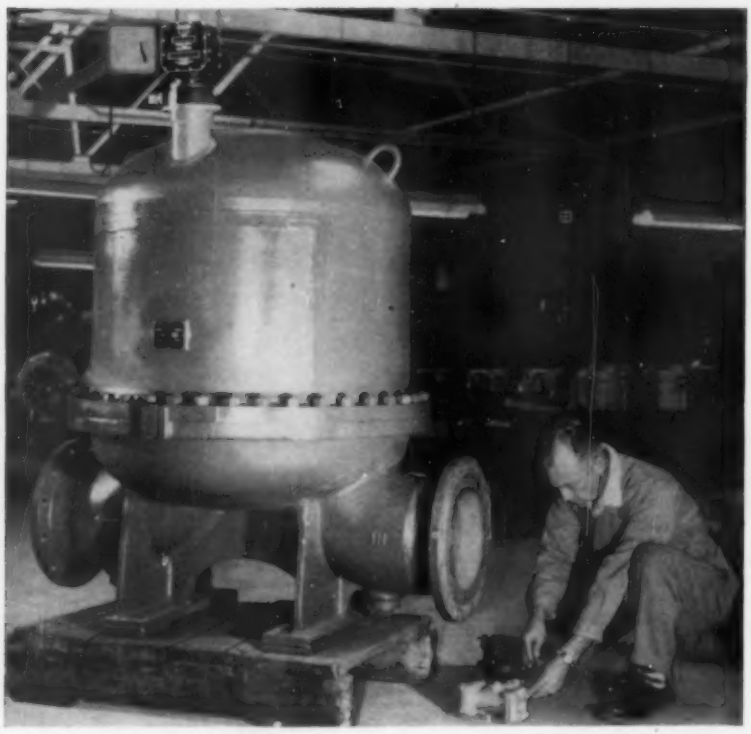
Grant Building • Pittsburgh 30, Pa.

District Sales Offices

Atlanta	Cleveland	Dayton	Los Angeles	Pittsburgh
Chicago	Dallas	Detroit	New York	Tulsa
		Houston	Philadelphia	Warren, Ohio

NEW EQUIPMENT

New Birotor Meter Has Capacity of 5,000 Bbl. Per Hour



With capacities to 5,000 bbl. per hour at a working pressure of 300 psi., the new postive-displacement Brodie Model B-123 birotor meter is designed to handle petroleum products or crudes in pipelines, bunkering, barge and tanker loading, refinery runs to stills, and other high-capacity services.

For sustained accuracy and minimum maintenance, the meter employs: (1) double-case construction to isolate the measuring unit from piping strain, (2) an antifriction, stainless-steel, ball-bearing rotor mounting, (3) balanced rotary operation without vanes or reciprocating parts, (4) no metal-to-metal contact, and (5) only two moving parts in the measuring chamber.

Removal of the cover dome gives access to the measuring unit for inspection, cleaning, or replacement—without disturbing line connections. The meter is available with 10 or 12-in., 150 or 300-lb. ASA flanges, or weld ends.

The outer housing consists of a welded cast-steel base and formed-steel cover dome. The timing gears and worm-gear counter drive are enclosed from the flowing stream. Drive adjustment in increments of 0.05 per cent may be made while the meter operates.

The B-123 meter is available with a choice of counters, printers, and remote-counter or accumulator system to permit two or more meters of equal or varying sizes to be operated in parallel. It may also be provided with an automatic temperature compensator to give counter readings in net barrels. **Write or call: Ralph N. Brodie Co., San Leandro, Calif., for details on Model B-123 Birotor meter.**

●

Oil-Stock Additives Prevent Gum

Six types are available for various crudes. Designed to prohibit gum formation in oil stocks, the additives are fatty amine derivatives which will stabilize No. 2 fuel or furnace oil. According to the maker, extensive tests have shown each additive to be par-

Send this **Showcase Coupon**

to the **Manufacturer** of the item in which you are interested. See name, address, and equipment name and/or model, in bold-face type at end of description.

NAME AND/OR MODEL NUMBER.....

.....

.....

Described in OIL AND GAS JOURNAL - Issue of **January 13, 1958**

NAME.....TITLE.....

COMPANY.....

ADDRESS.....

CITY.....STATE.....

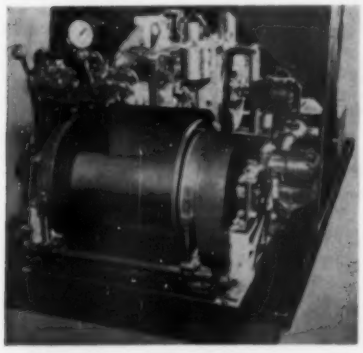
DATE.....

New Equipment

ticularly effective with certain crude-oil stocks, including Mid-Continent, Venezuelan, Mid-East, and West Texas crude stocks.

The additives range from light-amber liquids to tannish-brown solid paste at room temperature. In addition to preventing insoluble gums, the Armolads protect against color degradation and improve filterability. They are effective in economical concentrations costing as little as 1 cent per barrel, the maker says. **Write or call: Armour & Co., Chemical Div., 1355 West Thirty-First Street, Chicago 9, for details on Armolad oil additives.**

●



Line Reel For Offshore Use

The wire-line reel, designed specifically for offshore use, has a reel-spool capacity of 21,000 ft. of 0.082 wire line. It has a twin-brake system on both ends of the drum for effective and cool braking.

The power source is optional. The fluid drive uses a hydraulic pump and two hydraulic motors. Usually the power supplied by one hydraulic motor is enough. But for heavy pulls, the second motor may be used too. Four-way valves provide a drive either way.

A safety valve is provided to prevent wire-line breakage. And a metering valve governs reel-rotation speed. The skid mounting and lifting eyes assure easy handling. A protective covering protects the unit when not in use thus reducing corrosion caused by constant exposure to salt air and spray, the maker says. Over-all dimensions of the unit are 5½ ft. by 4 ft. by 4 ft. It is relatively lightweight. **Write or call: C. A. Mathey Machine Works, Inc., 212 S. Frankfort, Tulsa, for details on offshore wire-line reel.**

Thermocouple Cable Quickly Installed

This new Serv-Rite multipair thermocouple-extension cable is now available with an over-all polyvinyl-plastic sheath. The maker claims that when four or more pairs of wires are needed, the cable greatly reduces the cost of installation as compared to that of pulling individual pairs through conduit. And the cable permits the use of smaller conduit than for the same number of individual pairs.

Because of its rigidity and resistance to atmosphere and moisture, the

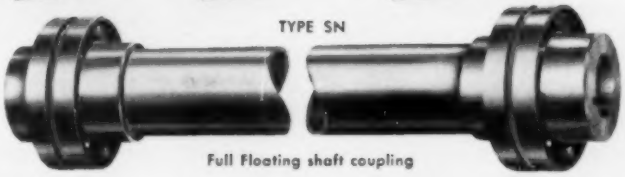
cable can be hung without conduit or installed in open trough. It is also approved for direct burial, the maker reports. Many of the commonly used types are carried in stock for immediate delivery. **Write or call: Claud S. Gordon Co., 3000 South Wallace Street, Chicago 16, for details on Serv-Rite thermocouple-extension cable.**

Protect Your Machinery with

THOMAS FLEXIBLE COUPLINGS

ALL METAL

NO LUBRICATION · NO MAINTENANCE · NO WEARING PARTS



Full Floating shaft coupling

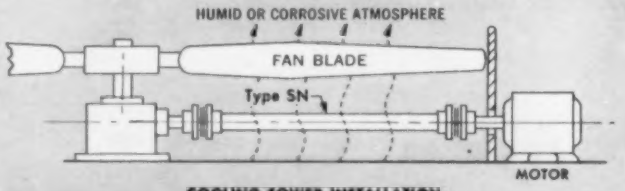
REFINERS! PIPE LINE MEN! DRILLING ENGINEERS! LABORATORY TECHNICIANS!

Thomas Couplings are used to advantage on Pumps, Compressors, Cooling Towers, Rigs or any other tough job where continuous operation and dependability are required.

Future maintenance costs and shutdowns are eliminated when you install Thomas Flexible Couplings.

UNDER LOAD and MISALIGNMENT ONLY THOMAS FLEXIBLE COUPLINGS OFFER ALL THESE ADVANTAGES.

1 Freedom from Backlash Torsional Rigidity
2 Free End Float
3 Smooth Continuous Drive with Constant Rotational Velocity
4 Visual Inspection While in Operation
5 Original Balance for Life
6 No Lubrication
7 No Wearing Parts
8 No Maintenance



COOLING TOWER INSTALLATION

In the typical cooling tower installation shown above, the motor — outside the humid or corrosive atmosphere — is connected by a floating-shaft coupling to the gear box under the large slow-speed, horizontal-blade fan.

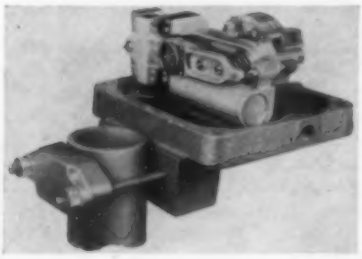
Write for engineering catalog 51A, and the name of your nearest Thomas representative

THOMAS FLEXIBLE COUPLING COMPANY

WARREN, PENNSYLVANIA, U.S.A.

SHOWCASE . . .

New Equipment



Transmitter Mounts In Any Position

Here is a new, compactly designed temperature and pressure transmitter. Designated Series 4600 for temperature and Series 4700 for pressure, it is a pneumatic force-balance. It employs a gas-filled thermal system for temperature measurement and a bellows element for pressure.

One outstanding feature is the balanced-beam design used. It permits mounting the transmitter in any position, without positional error.

Unit subassembly construction is used throughout. This permits removal of subassemblies without disturbing the beam assembly. Thermal systems and pressure elements are readily removed for change of range span. A derivative unit, which compensates for lags in the thermal system, can be quickly added on the underside of the baseplate. It requires no tubing or fittings. Also, a special provision allows an integral receiver gage to be mounted directly on the baseplate, without external connections.

A large pilot capacity is provided to insure fast operation—even with long transmission lines. The unit is compensated for ambient temperature and barometric pressure. **Write or call: Mason-Neilan Div., Worthington Corp., Nahatan Street, Norwood, Mass., for Bulletin 214 on temperature and pressure transmitter.**

●

Line Valve Prevents Shutoff Shock

The new model 500 Quantrol valve is suited for 3 to 10-in. oil, water, or gas lines. It is said to be particularly adaptable for all types of remote control.

Designed for working pressures to 150 psi. and temperatures to 150° F., the valve is reported to be particularly compact, lightweight, and easy to service in the line due to accessibility of simple unit-built assemblies. It was developed primarily to protect lines, pumps, and other equipment against damage from shutoff shock.

Control is by means of an internal pilot valve which may be actuated by solenoid, hydraulic or air cylinder, or direct manual control. The line valve consists of a spring-loaded valve-piston, seat, and cylinder assembly.

Rate of closing is easily adjustable by a needle valve on the internal passage through which upstream pressure is applied behind the valve piston. An O-ring seal in the nonwedging seat is said to assure bubble-tight closure without danger of sticking. **Write or call: Ralph N. Brodie Co., San Leandro, Calif., for Bulletin 650.**

●

Rotary Drill Comes in Four Models

Models of this new 1250 Series portable rotary-drilling rig offer a rated capacity of 1,250 ft. with 2⅜-in. drill pipe and to 1,500 ft. in heavy-duty models. The four available models come equipped with either hydraulic or chain-pulldown feed and

an air compressor or mud pump—or both. The maker says the rig is equally efficient at core, water-well, or shot-hole drilling.

Other features include: (1) a heavy-duty oil-bath type of rotary table, (2) double-drum type of draw works mounted on a common shaft, (3) hydraulically raised and lowered mast for fast rig up and tear down, and (4) proximity controls which give the operator complete control of rig without moving from his position.

Send this **Showcase Coupon**

to the **Manufacturer** of the item in which you are interested. See name, address, and equipment name and/or model, in bold-face type at end of description.

NAME AND/OR MODEL NUMBER.....

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Described in OIL AND GAS JOURNAL - Issue of **January 13, 1958**

NAME.....TITLE.....

COMPANY.....

ADDRESS.....

CITY.....STATE.....

DATE.....

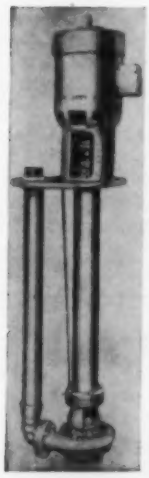
New Equipment

The rig is either truck or trailer-mounted. Power is provided either by the truck engine or an auxiliary-power unit. The chain-pulldown models feature Duo-flow feed, a mechanism consisting of a combination mechanical drive and high-torque reversible hydraulic motor. **Write or call: Joy Mfg. Co., Oliver Building, Pittsburgh 22, for Bulletin RM-713.**

●

Pump Features Interchangeable Parts

Suited for sump and process service, the vertical centrifugal pump comes in both wet and dry, single and duplex units. Capacities are available to 1,080 g.p.m. with heads to 290 ft. for pit depths to 20 ft.



The basic design of the Goulds Fig. 3171-2-3-4 sump pump is such that the pump unit may be adapted in the field for changed pit depths or pump ratings simply by installing new standardized parts.

Vaporproof construction can be had on all units with all possible points of leakage of vapor and fumes sealed, including the shaft, bearing housing, cover plate, discharge pipe, and grease pipes. Available construction and materials include Type 303 stainless-steel shaft; carbon, rubber, or carbon-filled Teflon bearings; stainless-steel or ceramic floats; and stainless-steel float rods. These permit the pump to handle various liquids. **Write or call: Goulds Pumps, Inc., 38 Black Brook Road, Seneca Falls, N. Y., for details on Fig. 3171-2-3-4 pump.**

●

Rotary Rig Drills To 13,000 Ft.

Both the draw works and the two high-pressure mud pumps on this German-made rig are driven by the two eight-cylinder diesel engines. The rotary table may be driven either by the draw works or by a six-cylinder diesel engine via a four-step reduction gear.

Lowering the engine speed about 50 per cent gives an infinitely variable speed range of about 15 to 200 r.p.m. for the rotary table when the four gear steps are used. For reversing the rotary table, the change-speed driving mechanism is equipped with a reversing gear.

When drill pipe is run in, hook loads are braked by an eddy-current brake. The heat developed is dispersed by water cooling. A hand-controlled band brake retains the draw-works drum when it's stationary.

The draw works is equipped with an automatic payout which maintains constant weight on the bit during drilling. For this purpose, a weight indicator is incorporated in the traveling block. By means of electrical impulses, it controls the speed of the motor on the payout gear and consequently that of the draw-works drum. The total load on the hook and the exact weight on the bit can at any time be read from indicators.

An electrically driven automatic cathead is installed on the drilling platform. All controls and checking instruments are accommodated in a control desk.

The derrick is assembled from prefabricated parts so it can be erected and dismantled swiftly. The derrick

OIL has put ALBERTA on the map and made the Province . . . CANADA'S LEADING OIL PRODUCER!

DURING THE PAST TEN YEARS	1947	1956
Producing Wells	606	7,390
Possible Daily Production	36,000	746,000
Money spent in Exploration and Development	$50,000,000	$450,000,000

The discovery and production of oil has made Alberta one of Canada's richest provinces. The progress and development of secondary industry are reflected in an increased population — in the vigorous economy of Alberta.

Progress has created another great resource — opportunity. The development of this resource, together with the natural facilities for establishment, provides unlimited potential for secondary industry.

From the production of oil and natural gas has come progress and opportunity for industry to grow and prosper with Alberta.

For further information on Alberta oil and the establishment of secondary industry write, Richard Martland, Director, Industrial Development Branch, Legislative Building, Dept. T.O.J.58, Edmonton, Alberta, Canada.

GOVERNMENT OF
ALBERTA
DEPARTMENT OF ECONOMIC AFFAIRS
Hon. A. Russell Patrick, Minister
Ralph R. Moore, Deputy Minister

SHOWCASE . . .

New Equipment

with substructure can be shifted without dismantling as an integral unit from one drilling location to the next, the maker says. **Write or call: Demag Ag, Duisburg, Postfash 2 und 12, Germany, for details on rotary drilling rig.**

●

Chemical Cleans Well Tubing, Rods

Named Gyp-Sol PM-90, this new acid type of chemical-cleaning compound has a quick-dissolving action upon rust, scale, and such gyp deposits as calcium carbonate, the maker reports. It will clean tubing and rods of these deposits without harmful attacks on the base metal.

As the liquid compound removes gyp deposits, rust, and scale from the tubing and rods, it puts them in suspension in the well fluid. Thus the operator can pump the deposits out of the well without harmful effects on the material of the well, according to the maker. The compound eliminates the need to pull rods and tubing to descale them. It is free-rinsing and nonharmful to oil. **Write or call: Mid-States Chemical Co., Inc., P. O. Box 306, Mount Vernon, Ill., for details on Gyp-Sol PM-90.**

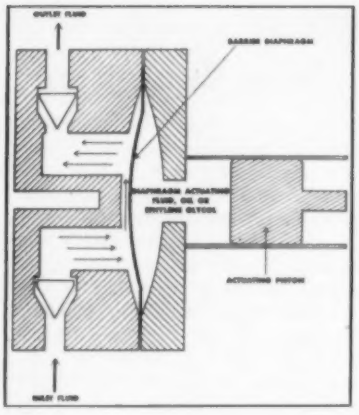
●

Diaphragm Pump Moves Corrosives

Both simplex and duplex models are available. The pump's suction lifts up to 20 ft. Design pressures of 50 psi. and higher are available.

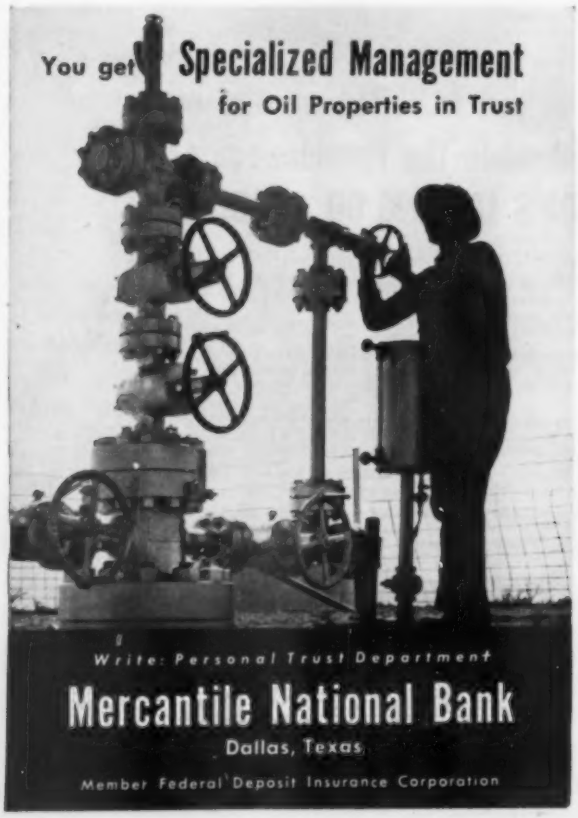
The Kemlon pump differs from piston type of pumps only in having a barrier diaphragm separating the working parts from the fluid handled. An actuating fluid between the piston and diaphragm exerts the force for pumping without mechanical linkage. The result is a smooth hydraulically balanced piston action with equal pressure on either side of the diaphragm barrier.

All pump surfaces contacting corrosive media are of solid fluoro-carbons, commonly called Kel-F Teflon. The heads and valves are molded solidly in plastic bonded to back-up plates. The pump is equipped with a NEMA Type C end-mounted motor available in explosionproof and other



types with a conventional design.

Since it is a positive-displacement type, the pump can be used either for metering single solutions or as a mixing-and-metering pump in the duplex design. A variable-speed electric drive can be attached to either of the two basic models for controlling volumes from 1 to 140 and 5 to 600 gal./hr. The pump can be used to control such process variables as flow, liquid level, pH, and temperature. **Write or call: Keystone Engineering Co., P. O. Box 14366, Houston 21, for details on Kemlon pump.**



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The Oil and Gas Journal
Box 1260 Tulsa, Oklahoma

SHOWCASE . . .

New Literature

Fragmented Plastic Foil used in drilling mud and cement to prevent fluid loss into formations is discussed in a new four-page bulletin. The material varies from pin-head size up to 2-in. pieces. It has a crinkled texture and an average thickness of 0.001 in. Because of its low specific gravity, the material remains in suspension in mud almost indefinitely, the maker says. It is not affected by water, oil, mud chemicals, bacterial action, or high bottom-hole temperatures. **Write or call: Dowell Incorporated, Tulsa 1, for Jelflake bulletin.**

●

Concentration Conversion Chart has been prepared for petrochemists. Suitable for use on wall or desk, the chart provides an easy and rapid means of converting petroleum-additive concentrations into any of the seven units most frequently employed in the laboratory and in production. **Write or call: Eastman Chemical Products, Inc., Kingsport, Tenn., for Tenamene concentration converter chart.**

●

Versatility of Oxidation Catalysts for industrial air pollution control is the subject of a six-page paper available. The article deals with actual installations in carbon-black, insulation, oil-refining, and chemical processing plants. It points out that successful systems can be designed even where abrasive dusts, large particles and inorganic materials which tend to poison catalysts are present. Photos, charts, and flow diagrams show the use of the catalysts. **Write or call: Oxy-Catalyst, Inc., Wayne, Pa., for oxidation catalysts bulletin.**

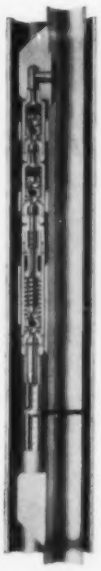
●

General Pipe-Data Reference Booklet is now available. The brochure lists size, weight, carloading, and pressure data for regular and special-weight plain-end line pipe. The pipes reviewed range in size from 6⅝ to 72 in. o.d. Included in the data is information on the maker's new 6 to 16-in. electric-resistance mill. **Write or call: Cal-Metal Pipe Corp., P. O. Box 2548, Baton Rouge, La., for general pipe-data booklet.**

●

A Comprehensive Review of Sulfur—its production and applications—is presented in a new 48-page booklet. Production, refining, and uses of sul-

TRADE MARK TIME TESTED MACCO GAS LIFT REG. U.S. PAT. OFF.



Patented

BOTTOM HOLE CHEMICAL INJECTION VALVE
MACCO "Outside Mounted" Chemical Injection Valve Assembly

This valve affords an effective and proved method of inhibiting corrosion **by adding exactly controlled amounts of chemical inhibitors into the tubing . . .** without losses, regardless of pressure conditions or pressure variations inside the tubing. This is accomplished by pumping the inhibitor into the annulus (filled with 40 parts carrier fluid to 1 part inhibitor, for example) and forcing it through the chemical-injection valve set above a packer. Since this system is hydraulic, the quantity entering the tubing will be the same as the quantity pumped into the annulus at the surface. Thus, varying pressure conditions inside the tubing do not affect the amount of inhibitor injected. This method provides protection for three surfaces in one operation—the inside and outside of tubing plus the inside of the casing. (This process is fully patented by Macco Oil Tool Company, Inc.)

Write for additional literature or information.

MACCO OIL TOOL COMPANY, INC.
Phone UN 1-1253
1521 Prince P. O. Box 7288 Houston 8, Texas

ACCO for Better Values

ACCO BOOMER CHAINS

Ideal for many oil field services

• You will find many uses for ACCO Boomer Chains—the strong, rugged chains specially designed for such applications as booming loads, winching and towing. ACCO Boomer Chains are made from H. C. High Test steel or Accoloy steel in 20-foot lengths. Each Boomer Chain has an ACCO drop-forged Grab Hook (I-beam type) on each end, attached at the factory and proof tested. Hook is of same material as chain.

Boomer Chains of H. C. High Test are available in six sizes, from ¼" x 20 ft. through ⅝" x 20 ft. . . . packed one to a blue bag. Chains of Accoloy are made in four sizes, from ⅜" x 20 ft. through ⅝" x 20 ft. . . . packed one to an orange bag.

You need these fine ACCO products, too . . .
WEED TRUCK CHAINS
—engineered for oil field use
WINCH LINE TAIL CHAINS
—flexible end-member for wire rope

American Chain Division
AMERICAN CHAIN & CABLE
Bridgeport, Conn. • Factories: *York and *Braddock, Pa.
Sales Offices: *Atlanta, Boston, *Chicago, *Denver, Detroit, *Houston, *Los Angeles, New York, Philadelphia, Pittsburgh, *Portland, Ore., *San Francisco
*Indicates Warehouse Stocks

ACCO

Delta DC-7's link the oil fields of CUBA and VENEZUELA

with non-stop service between
HAVANA-CARACAS
one-stop service between
NEW ORLEANS-CARACAS

Deluxe *Royal Caribe* DC-7 through-planes daily between Chicago and Caracas. Dovetail connections at New Orleans to and from all points in mid-America and the West Coast. Depend upon Delta's *Golden Crown* DC-7's to keep pace with the fast-growing needs of the oil industry.

FLY THE RADAR-EQUIPPED
Royal Caribe
Golden Crown DC-7's and DC-7B's

Through the magic of Radar, your Captain can "see" ahead up to 150 miles, select the smoothest course.

One of America's Pioneer Scheduled Airlines
Delta AIR LINES

Serving 60 cities in the U.S.A. and the Caribbean
General Offices: Atlanta Airport, Atlanta, Georgia

fur are described. Tables and graphs show the properties of sulfur in an eight-page section. **Write or call: Stauffer Chemical Co., 380 Madison Avenue, New York 17, for Stauffer sulfur booklet.**

•

Chromalloy Process Bulletin 17-1 describes the results of diffusing chromium into the surface of iron and steel parts so the parts become resistant to corrosion, heat, and wear. Surfaces so treated do not scale at high temperatures, have long wear life, resist galling and fretting corrosion and atmospheric and many kinds of chemical corrosion, and do not spall, peel, or chip, according to the maker. The four-page bulletin details various applications of the process. **Write or call: Chromalloy Corp., 450 Tarrytown Road, White Plains, N. Y., for Bulletin 17-1.**

•

Fluid-Sealed Polished-Rod Stuffing Box Bulletin SB-8 describes the Vernon standard "pack-off" and lubricator type of stuffing boxes. All inner parts of the stuffing boxes which contact the polished rods are made of soft brass or bronze. Dimension charts and cutaway drawings give construction details on the stuffing boxes. **Write or call: Vernon Tool Co., Ltd., 1101 Meridian Avenue, Alhambra, Calif., for Bulletin SB-8.**

•

Latex Oil-Well Cement—a low fluid-loss type—is reviewed in a new six-page bulletin. The cement is designed for primary-casing cementing, tail-in on primary-cementing jobs, squeeze cementing, and cementing of liners. The fluid loss ranges from 20 to 30 cc. in 30 minutes, the maker reports. The latex compound is a formulation of latex and surfactant. They do not require blending at the well site and may be added directly to the mixing water. The results of high-pressure thickening-time tests and perforating tests are shown in the bulletin. **Write or call: Halliburton Oil Well Cementing Co., Duncan, Okla., for Latex Cement bulletin.**

•

Extreme Line Casing for deep, high-pressure wells is discussed in a new eight-page bulletin. The casing features high joint strength, positive resistance to leakage, coupling elimination, high running speed, external and internal streamlining, and high resistance to damage. The bulletin shows the manufacturing processes

and provides a size and clearance chart. **Write or call: Jones & Laughlin Steel Corp., 3 Gateway Center, Pittsburgh 30, for Extreme Line Casing bulletin.**

●

Data Logger Catalog 30A1200 describes the building-block construction and flexible pinboard programming of the F & P Series 1200 data-reduction system. The pinboard permits control of measurement, digital-multiplication factor, range, zero suppression, point identification, digital-record format, decimal-point locations, and one or more digital-recording devices. The logger accepts any combination of either up to 200 or 2,000 inputs, depending upon the scanning method used. It makes conversions to d.c. voltages. **Write or call: Fischer & Porter Co., 464 Jacksonville Road, Hatboro, Pa., for Catalog 30A1200.**

●

Hydrofluoric Acid — anhydrous and aqueous—is discussed in a new 12-page booklet. The uses for hydrofluoric acid and its compounds are detailed, as well as their physical properties. Charts shown include vapor pressure, boiling-point and vapor composition, enthalpy concentration point, and viscosity. A special 20-page handbook on handling, safety, and sample analysis is also included in the release. The smaller booklet sets down the correct procedures for treatment of hydrofluoric-acid burns and safe handling procedures. **Write or call: Stauffer Chemical Co., 380 Madison Avenue, New York 17, for Hydrofluoric Acid bulletin.**

●

Product Catalog for Vokes Ltd.—an English firm which primarily manufactures filters—is now available. Dry-fabric air filters, inverted and hanging air filters, panel type, and dry and oil-wetted filters are some of the products discussed. Fuel and oil filters are also reviewed. Charts and diagrams are shown for each of the products in the line. **Write or call: Vokes Ltd., Guildford, England, for Air Filtration catalog.**

●

Globe-Type Needle Valves are described in a new four-page brochure. The uses for the N-20 and N-28 valves are described. Pertinent technical data are presented in chart form, features, cutaway views, and diagrams. **Write or call: Kerotest Mfg. Co., 2525 Liberty Avenue, Pittsburgh 22, for Globe-Type Needle Valves brochure.**

Campbell Chain

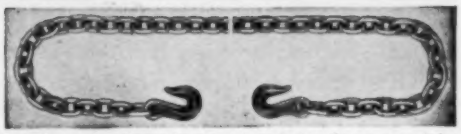
GOES BIG WITH ANY RIG!

"Measure-Mark" Chain

CAM-ALLOY and CAMPBELL HIGH TEST STEEL

Exactly marked every 5'. Color-coded for instant grade identification. Standard footage in every pack—color-coded labels with inventory control. **Cam-Alloy** features *extremely* high tensile strength—excellent resistance to wear—light weight for given load. Look for the *orange* "Measure-Mark." Campbell **High Test** Steel Chain is high-carbon steel, heat-treated for high tensile strength and maximum resistance to abrasion. Short links give maximum flexibility. Look for the *blue* "Measure-Mark."

BOOMER CHAINS



Made from Cam-Alloy or High Test Steel Chain with Grab Hook each end, 20 feet long. Supplied bright finish. Packed one chain in cloth bag. In dimensions and weights for every job.

WINCH LINE CHAINS

Made from High Test Steel Chain, heat-treated for increased resistance to wear and shock loads. Tagged for size and length. Bright finish. In dimensions and weights for every job.

TRUCK TIRE CHAINS

Available in 3 grades: *Lug-Reinforced* for maximum traction and wear, *Mud-Service* for off-the-road use, *Highway Service* for general use . . . single pneumatic and dual triple.

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WAREHOUSES: Campbell Chain Company, 712 "R" St., P.O. Box #1144, Sacramento, Calif.; 3085 N.W. Front St., Portland 10, Oregon; Wald Terminal Warehouse, 902 Live Oak, Houston, Texas.

WEST COAST SALES MANAGER: D. R. Coutts, 1933 Mission Ridge Road, Box 1175, Santa Barbara, Cal.

TERRITORY MANAGERS: J. N. Kuhl, 7000 S. Shore Drive Hotel, Chicago, Ill.; S. Hardison, 1970 Val Verde, Germantown, Tennessee; S. Adsit, 17 E. 57th St., Kansas City, Mo.; A. E. Vincent, 3917 Thaxton Ave., S.E., Albuquerque, N. Mex.; K. Steinmetz, 1339 Sherwood Road, Glenview, Ill.; D. A. Ruffin, 5623 Boaz St.—Apt. #90, Dallas 9, Texas; G. W. Ferree, 5634 Putnam Drive, Birmingham, Mich.

CONTACT ANY OF THE CAMPBELL REPRESENTATIVES ABOVE FOR COMPLETE INFORMATION ON *ANY* TYPE OF CHAIN—OR HELP WITH A PARTICULAR CHAIN PROBLEM.

Seger and Wilson Named By Bethlehem Supply Co.

Christian Seger, Jr., has been elected vice president and treasurer, and Harry A. Wilson has been appointed assistant to president.

In 1938 Seger joined Bethlehem Supply as credit manager and 3 years later was transferred to Houston to serve as southern division manager of sales. After World War II he was elected vice president of National

C. SEGER, JR.

H. A. WILSON

Bank of Tulsa where he served in the commercial loan department. He rejoined Bethlehem Supply as treasurer in 1948.

Wilson was employed by Superior Oil Corp. from 1920 to 1937. At that time he joined Bethlehem Supply as purchasing agent. In 1939 he became manager of price and order control in the sales department and in 1940 was made office manager.

Bradford Laboratories Has New Office-Laboratory ..

in Abilene, Tex. Albert W. Baumgartner will organize and manage this office.

The new laboratory, as explained by General Manager A. Richard Ellenberger, is the first step in a planned expansion program in the Southwest. Bradford Laboratories, a pioneer oilfield water consulting firm, is a department of Hall Laboratories Division, Hagan Chemicals & Controls, Inc., Pittsburgh.

The Abilene branch will concentrate on water-flood projects in West Central Texas. It is the fourth regional laboratory in the United States. There are foreign offices in Canada and Venezuela. Other regional office-laboratories are in Bradford, Pa.; Huntington, W. Va.; and Evansville, Ind. Each regional laboratory can cope with every type of oil-field water problem, from treatment of raw water supplies and blends to stabilization of fluids in producing wells. Each field man is equipped to make many on-the-spot water analyses or initiate bacteriological and corrosion studies at the point of sampling.

John A. Roebling's Sons Corp. Elects Hartmann . .

vice president of sales, according to C. R. Tyson, executive vice president of Roebling, a subsidiary of Colorado Fuel & Iron Corp. E. George Hartmann will be located at the corporation's main office in Trenton, N. J.

Hartmann replaces Ernest C. Low, who has retired after 47 years with the firm. W. C. Palmer, now sales manager of the wire and cold-rolled products division, will replace Hartmann as general product manager. F. T. Updike will move from the position of chief engineer to that of sales manager.

Hartmann has had over 37 years' experience in the wire industry. He joined Roebling in 1940. For 20 years prior to that he was with Wickwire Spencer Steel Division of Colorado Fuel & Iron.

B. E. Irby Made Store Mgr. by J & L Supply . .

for its store at Longview, Tex., according to A. G. Bastian, manager, field sales division, Tulsa.

Irby, previously manager of the Gladewater store since 1956, joined Jones & Laughlin Supply Division in 1954.

Republic Store Managers Complete Management Class

Republic Supply Co. personnel participating in the class were: (back row), left to right) Store Managers J. J. Miller, Hobbs, N. M.; B. R. Newton, Big Spring, Tex.; and C. T. Cox, Harvey, La.

Front row: D. B. Afflack, floorman, Healdton, Okla.; George Steinmeyer, instructor, general office, Oklahoma City; and L. G. McWorkman, store manager, Kermit, Tex.

Weatherford Oil Tool Co. Names T. W. Martin . .

as vice president, according to Jess Hall, Jr., president.

Martin has been with Weatherford 6 years. Starting as a salesman, he was general manager of Weatherford's Canadian firm from 1953 to 1955, at which time he was moved to Houston as marketing and finance manager. He was financial officer before being named assistant secretary-treasurer.

T. W. MARTIN

Cooper-Bessemer Corp. Forms New Division . .

to be known as the electronics-controls division. It will be headed by Reed D. Hamilton.

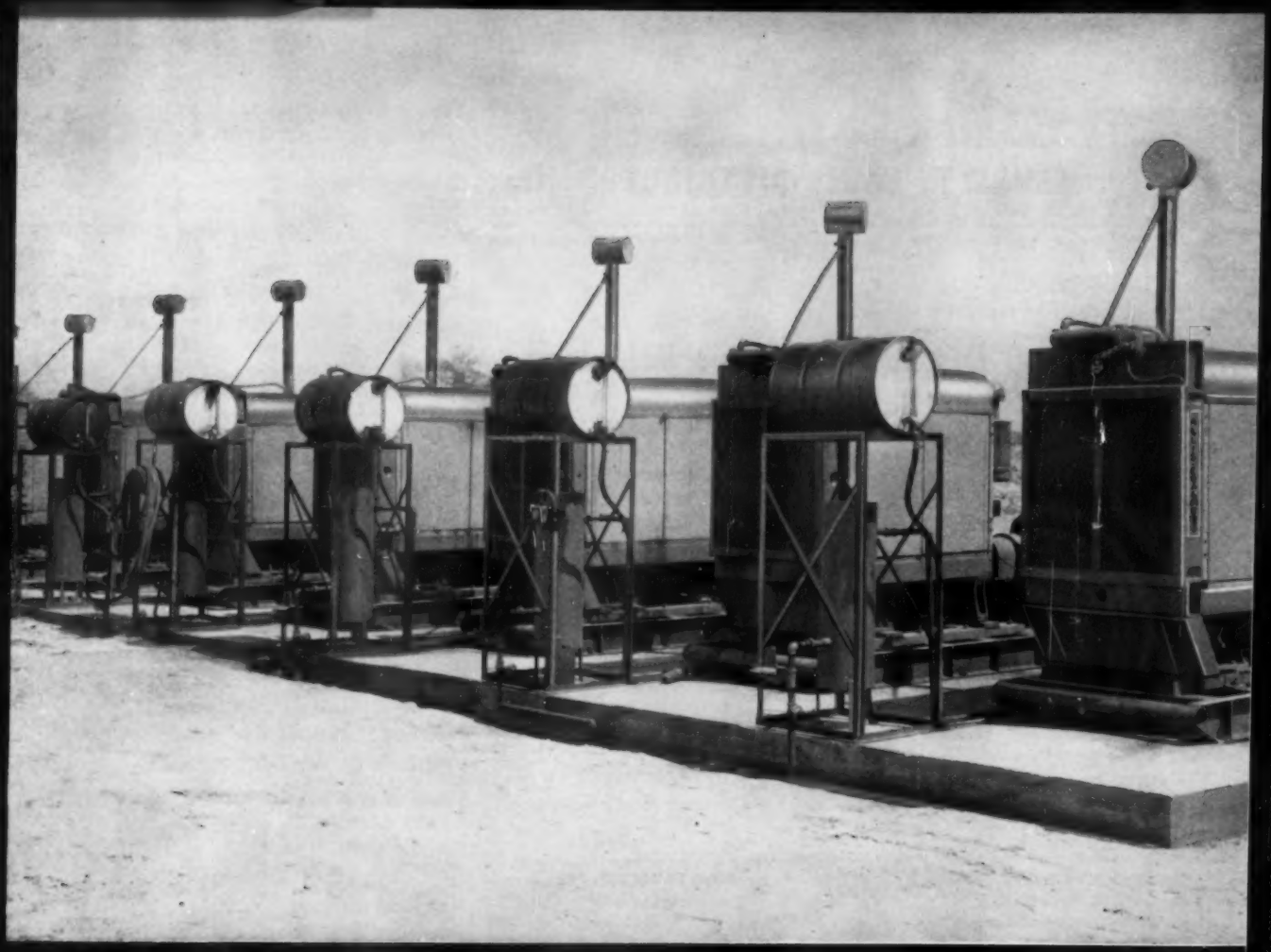
According to Ralph L. Boyer, vice president and director of engineering, the anticipated trend to automation of power and compressing operations by pipeline, petrochemical and industrial plants served by Cooper-Bessemer has initiated the company's decision to create this new division.

The first compressor to have complete single push-button actuation was a Cooper-Bessemer unit installed on a major pipeline in 1954. By simply pushing one button, this particular compressor unit starts as simply as an automobile. Once started, the engine picks up its load automatically, constantly monitors operating conditions and ultimately shuts down upon demand of a dispatcher.

Homco Transfers, Promotes

P. J. Bedford has been transferred from Brookhaven to Hattiesburg as sales and service representative; M. R. Brenek from E W S supervisor to field maintenance engineer, Houston; L. R. Denham from Denver to Casper, Wyo., as city salesman; William H. Dodson, Jr., from Kimball, Neb., to Bay City, Tex.; B. M. English from Casper to Denver as city salesman; C. J. Erwin from New Orleans, La., to New York City as export manager for Houston Oil Field Material Co.

J. E. Kerr has been promoted from assistant division manager to division manager, New Orleans; Gerald Shoemake has moved from Pearsall to Liberty, Tex.; R. C. Unger, Jr., from



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KEEPS WORKING DAY AFTER DAY. There is unusual simplicity in rugged Allis-Chalmers engines. Diesel models, for instance, have 30 to 50 percent fewer wearing parts than competitive engines. Less can go wrong when parts are fewer and stronger.

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See your Allis-Chalmers dealer for full information on engines that will get the most out of *your* equipment — *any* type or size, 9 to 516 hp; *any* fuel, LP or natural gas, gasoline or diesel; for *any* application. Allis-Chalmers, Buda Division, Milwaukee 1, Wisconsin.

BC-108

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HARRISBURG STEEL CORPORATION
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Forged Steel Flanges and Seamless Casing Couplings.

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Volcano Superior and Gulf States All Steel Gas Burners for OIL COUNTRY BOILERS.

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Welding Cups—Dished & Flanged Heads.

WESTERN SAFETY BARREL STAND
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Stand lifts, holds, tilts 55 gal. barrels Prevents spillage—easily loaded.

MILLS IRON WORKS, INC.
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Seamless Swage Nipples, Bull Plugs & Welding Reducers.

WHEELING MACHINE PRODUCTS CO.
Wheeling, West Virginia
XL Steel Pipe Couplings for OIL COUNTRY TUBULAR PRODUCTS.

Liberty to Bay City; M. B. Watson from Alice to Sam Fordyce; and Roy N. Young from Corpus Christi to Casper.

Oil Well Supply Division Appoints in Two Areas . .

of its operations. B. J. Travis has been appointed assistant district engineer, secondary recovery sales, at Midland, Tex., according to William Miskimins, Central Midwest area manager.

Samuel K. Leach, district representative at Bridgeport, Ill., has been transferred to Charleston, W. Va., it has been announced by C. H. Maynard, eastern area manager of the division.

Travis, who was employed by Oilwell in 1952 at Odessa, Tex., was appointed assistant district engineer, machinery and equipment sales, at Odessa in 1954. Leach was employed in 1955 as district representative at Bridgeport.

Davey Compressor Co. Names L. W. Darling . .

L. W. DARLING

general sales manager, according to J. T. Myers, vice president and general manager. Darling will direct the activities of 12 district offices and more than 150 direct factory distributors. He will supervise sales of the three Davey operating divisions which produce portable compressors, air tools, rotary drill rigs and industrial compressors.

Darling has been with Davey for the past 12 years. He was formerly assistant vice president, a position he will retain in addition to his new duties. He has also served as manager of government sales; midwestern district manager in charge of the Chicago office; and as New England district manager.

Garlock Packing Assigns Munger to New Area . .

in southern Michigan, northern Indiana, and parts of northern Ohio. James H. Munger formerly operated out of the firm's Detroit office, according to J. B. Sewell, vice president in charge of sales for Garlock Packing Co., Palmyra, N. Y.

Garlock manufactures mechanical packings, gaskets and seals of all types.

Leland Equipment Co. Elects W. Wayne Hood . .

W. W. HOOD

vice president in charge of sales. Re-elected to their former positions at the annual directors' meeting were W. R. Borgman, president; A. C. Beckner, vice president; and John E. Timberlake, secretary-treasurer. Hood is a veteran of 18 years in the construction machinery business and several years in contracting. Before moving to Tulsa, Hood was in charge of sales for Leland in southeastern Oklahoma. He had formerly been in Leland's Oklahoma City office for a number of years and has been a stockholder and director since 1947.

Leland is a distributor of heavy construction equipment and also manufactures heavy-duty oil-field and construction truck bodies and trailers. In addition to its Tulsa and Oklahoma City offices, Leland has an office and warehouse in Longview, Tex.

Acme Oil Tool of Texas Buys Machine Shop . .

in Duncan, Okla. Acme Oil Tool Co. of Texas, Inc., formerly Wichita Falls Fishing Tool Co. is an affiliate of Acme Oil Tool Co., Inc., whose home offices are in Oklahoma City. The Duncan machine shop, formerly owned by MCM Machine Works, will continue to offer repair work on light and heavy oil-field equipment.

According to Bill McFarland, president of the Acme corporation, Great Bend Fishing Tool Co. is no longer affiliated with Acme Oil Tool. Other Acme stores are located in Woodward, Healdton and Duncan, Okla.; Wichita Falls, Tex.; Edmondton, Alta., and Fort St. John, B. C., Canada; and Oklahoma City.

Additional officers in Oklahoma City include J. P. Stephens, vice president; Howard Weston, secretary; and Paul Raymond, treasurer.

Security Representative Ends Foreign Oil Tour . .

with a report of increased petroleum activity wherever he visited.

Vernon Mitchell, export representative for Security Engineering Division, spent 7 months visiting Japan, Formosa, the Philippines, Thailand, Burma, Borneo, Java, Sumatra, New Guinea, Pakistan, Iran, Iraq, Lebanon, Turkey, Libya and England. According to A. M. Birnie, executive vice president in charge of world-wide sales, the purpose of the trip was to study drilling requirements in those areas as related to research, production and sales activities of Security's manufacturing plants in Dallas, Tex., Manchester, England; and Whittier, Calif.

Future Oil Tools Inspire New BJ Department . .

which has been set up as a special research and development group within its engineering department. According to Garth Nicolson, vice president and general manager of Byron Jackson Tools, Inc., the new group is under the general direction of Ray G. Taylor, Jr., manager of oil field products engineering, and is headed by Simon Tamny, supervisor of research and development.

The new group concentrates on basic drilling problems. This staff has access to all engineering and laboratory facilities of Byron Jackson as well as to facilities and experience of the research center of Borg-Warner Corp., BJ's parent company.

Pittsburgh Corning Corp. Names R. J. Farquharson

As sales representative, he will service the State of Oklahoma, northern Texas, and Dallas, Fort Worth, Tyler, Waco, Austin and San Antonio.

Farquharson will assist distributors of PC glass blocks and foamglas building, industrial and low-temperature insulation. He will make contacts concerning the application of these products.

Dresser Industries Makes Executive Promotions . .

to carry out the firm's policy of management in depth, according to J. B. O'Connor, president.

R. E. Reimer was elevated to executive vice president and will also continue to serve as treasurer. John Lawrence was also named as an executive vice president. Thomas L. Moody was appointed vice president in charge of industrial relations. J. Douglas Mayson succeeded Reimer as secretary, and Cecil C. Hill and Paul E. Brodrick were made assistant treasurers.

Reimer has been with Dresser since

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Vapor Conservation, Fire Prevention and Accessory Equipment for Bulk Storage Tanks

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THE JOHNSTON & JENNINGS CO.

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division of PETTIBONE MULLIKEN CORPORATION

1929, having served in various top management posts. Lawrence recently resigned as president of Joy Manufacturing Co. to join Dresser Industries, Inc. Moody moves into a vice presidency after 15 years as director of industrial relations. Mayson moved up from his post as assistant secretary to which he was appointed in April 1957. Hill recently joined the Dresser home office top management group on special assignments after 15 years with Clark Bros. Co., a Dresser subsidiary. Since joining Dresser in 1945, Brodrick has served as assistant controller and at present is director of shareholder relations.

Texsteam Corp. Acquires Graham-Lemunyon Corp. . .

and moves its assets from Los Angeles to Texsteam's recently enlarged plant in Houston.

C. P. Graham, the inventor of Graham nonlubricated plug valves, is being retained by Texsteam as a consultant on new valve designs, it has been announced by A. D. Bruce, president of Vapor Heating Corp., Texsteam's parent company.

Texsteam has been selling the Graham plug valves to the oil-production industry in the U. S, Canada and other countries for the past 3 years. Texsteam plans to increase the number of valves in the line, then extend sales efforts to the chemical and other industrial markets.

Martin Eichelberger Joins Aero Service Corp. . .

as a representative of the company's airborne geophysics division.

Eichelberger has a background of 19 years' exploration experience in the oil industry. He has spent 11 years on foreign assignments. Previously, he was with Geophysical Service, Inc., United Geophysical Corp. and Magnolia Petroleum Corp.

Kelite Corp. Appoints District Sales Manager . .

K. C. EDSON

in Los Angeles. Kenneth C. Edson wi'l be in charge of sales in one of two Los Angeles districts of the western sales region, according to William Sorensen, marketing director. Edson has had 15 years of research, process engineering, customer service, and sales experience with Skelly Oil Co. and Du Pont Co.

Rockwell Manufacturing Co. Promotes Luckett . .

P. H. LUCKETT

to assistant gas products manager for the company's meter and valve division with headquarters in Pittsburgh. In announcing the promotion of Pat H. Luckett, Donald C. Morgan, assistant vice president and product manager-gas products, also revealed that the instrument division sales and service groups and products will become part of the nationwide gas products sales setup in the meter and valve division.

Luckett, who joined the instrument division in 1948 as a sales trainee, was sales manager of the division prior to his promotion.

F & P Names Artz . .

district manager of its Los Angeles office. Bernard A. Artz is succeeded by G. Dale Hetrick, Jr., as district manager of the Knoxville office of Fischer & Porter Co.

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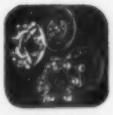
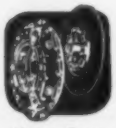
Heavy-Duty
POWER
TAKE-
OFF

NEEDS ONLY
ONCE A YEAR
LUBRICATION



Small Spring Loaded



Heavy Duty Spring Loaded

Oil or Dry Multiple Disc

Heavy Duty Over Center

Power Take-Offs

Speed Reducers

The special, large Timken main bearings in the new ROCKFORD POWER TAKE-OFF are adjusted when assembled at the factory. They require no further adjustment—and run in a reservoir of lubricating oil that needs replenishment not oftener than once a year. The clutch throw-out bearing is lubricated for life and requires no further attention. Cut down on the servicing time needed by *your* equipment by specifying this new ROCKFORD Oil Field type POWER TAKE-OFF.

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Gives dimensions, capacity tables and complete specifications. Suggests typical applications.

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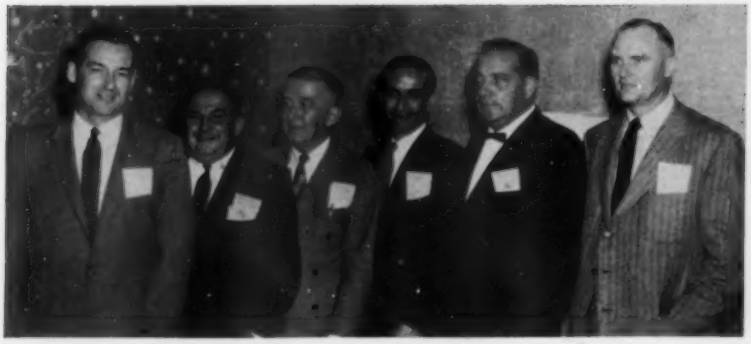
CLUTCHES



Houston Nomads Host to Foreign Guests . .

at a recent meeting of the chapter. The guests included: (left to right) E. A. Barrall, Socony-Mobil, Calgary, Alta. Canada; J. Worsdall, Cameron Iron Works, Mexico City; Dr. J. Brian Eby, Houston, guest speaker; Hassan Mirzai and J. C. Robbins, Iran Oil Co., Teheran, Iran; and W. E. Armentrout, Southeastern Drilling Co. Teheran.

Ajax Iron Works Transfers James L. Turner . .

from the Illinois basin to Calgary, Alta., Canada, to cover the western Canada fields.

Prior to joining Ajax 2 years ago as a field representative, Turner had served in many field capacities in eastern oil-producing areas.

Sutherland Heads New C. Lee Cook Branch . .

SUTHERLAND

in Los Angeles. The new branch office and warehouse for which Robert D. Sutherland has been appointed branch manager was opened January 1.

Morgan Washburn, who has been California agent for C. Lee Cook Co. since 1928, is retiring but will be available as a consultant for the company.

Sutherland has served with Ingersoll-Rand, Worthington Corp., and while with Ralph M. Parsons Co. was in charge of its mechanical equipment section.

Du Pont's Polychemicals Department Promotes . .

Robert L. Hershey and Walter H. Salzenberg. Hershey, general manager of the polychemicals department, has been elected a director, vice president and member of the executive committee of Du Pont Co. William H. Ward has retired as a vice president and member of the executive committee after 42 years with the company. He will continue as a director.

Salzenberg, assistant general manager of the polychemicals department, was appointed to succeed Hershey as general manager.

Hershey has been with the company 21 years in research and management positions. He served at the experimental station; in the chemical division of the ammonia department as assistant research director and assistant general manager of the department. In 1956 he became general manager of the polychemicals department.

Salzenberg has been with Du Pont since 1929. His experience has included service in the engineering department and the Grasselli chemicals department. He was transferred to the polychemicals department as assistant general manager early in 1957.

Milwhite Mud Sales Co. Names George Connor . .

GEORGE CONNOR

vice president and operations manager. As operations manager, Connor will supervise operations in the Gulf Coast, Mid-Continent and Rocky Mountain regions and Canada, it has been announced by Glen C. Clark, president of Wilwhite, a subsidiary of Mississippi River Fuel Corp.

Connor joined Milwhite in 1954 as sales manager, after being with Garret Oil Tools, Inc. Last year he was promoted to vice president in charge of sales at the company's general offices in Houston.

M. J. Yost Made Sales Mgr. by Chrysler Corp. . .

M. J. YOST

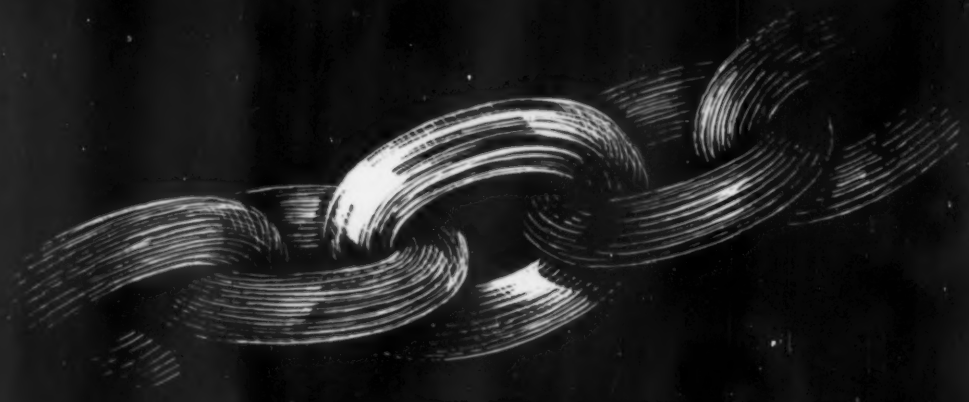
for its marine and industrial engine division, according to C. C. Williams, vice president of sales for the division. Yost, who has been with Chrysler 30 years, has been manager of the division's West Coast office at Los Angeles since 1956. Prior to that time he was the division's sales representative at Seattle, Wash., and before that was sales and service representative operating out of Detroit.

Sales Personnel of Welex, Inc., Complete Course . .

in interpretation and analysis of resistivity and radioactivity logging. The 2-week course, which was held in the Welex research and development laboratory in Houston, was conducted by R. B. Smith.

Those who completed the course are (left to right): Denzel Williamson, sales engineer, Pauls Valley, Okla.; L. B. Putnam, sales manager, Midland, Tex.; B. R. Redwine, vice president, Welex of Canada, Ltd., Calgary; W. V. Holcomb, engineering trainee, Odessa, Tex.; A. N. Taylor, sales engineer, Pampa, Tex.; D. L. Biles, sales engineer, Hobbs, N. M.; W. L. Porter, sales manager, Panhandle-North Texas division, Dallas; Smith, instructor; F. D. Sawyer, assistant sales manager, Fort Worth; L. M. Wood, sales engineer, Abilene, Tex.; and B. L. Hays, district manager, Farmington.

found: the missing link in down-hole correlation . . .



the new CORE-GAMMA SURFACE LOG!

During the past several months, Core Lab's personnel in the Permian Basin have been performing a very unusual service.

To attack the problem of correlating driller's depths versus wire line depths, a practical method was devised for *running a gamma ray logging instrument "over" core delivered to the lab for analysis.* The result is a *Core-Gamma Surface Log** — proven to be dramatically effective.

Currently, many operators in the area are coordinating this "missing link" with visual inspection of the core and down-hole gamma ray logs (from the same well or off-set tests) to pinpoint selective perforating, to accurately orient themselves within a productive section, and to precisely reconstruct the original position of lost core.

This sound, economical bridging of the gap between different types of down-hole information nails down the importance of having core available at the surface.

Again, with its new Core-Gamma Surface Log, Core Lab demonstrates how the entire industry benefits from a fully integrated field-and-research effort.

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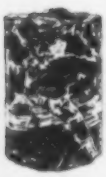

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The Oklahoma Story: Deeper Pays and Multiple Pays

By Frank J. Gardner
Exploration Editor

ANOTHER MULTIPAY OIL FIELD has been uncovered by Gulf Oil Corp. in southwestern McClain County, Oklahoma, at its 1 Beard wildcat. Drill-stem tests have shown commercial pays in the first Bromide, second Bromide, and Tulip Creek sands . . . all Ordovician. Depths of the pays are 10,000 to 11,000 ft.

AFTER more than 50 years of exploration and production, Oklahoma continues to surprise the oil finder. In its 1957 semicentennial year, it experienced one of the best discovery records in its history. And the odds are that 1958 will be even better.

While vast new areas were opened to production in 1957, especially in the northwest, even greater vistas were met at depth. Depth records were broken in every category, and it's likely that these new records will be shattered again in the months ahead. Oklahomans are now convinced that the deeply buried rocks in the southern and western parts of their state hold a mighty store of unfound oil and gas.

The emphasis is on the Ordovician in this deep campaign. Chief Ordovician target is the Simpson group. The flush 15,000-16,000 ft. strikes at the old Carter-Knox field of Stephens and Grady counties have triggered a deep play all through southern Oklahoma.

A series of hits . . . One center of Ordovician interest, and the setting for a new fault-trend play, lies in southwestern McClain County, 35 miles south of Oklahoma City, and just north of the famous Golden Trend. A series of 1956 hits in Hunton - Devonian and Simpson - Ordovician rocks in this area has paid off handsomely with more of the same in 1957. Outstanding among these at the moment is Gulf Oil Corp. 1 Beard, in Section 18-5n-3w. This is a triple-threat discovery, having found oil in the first Bromide, second Bromide, and Tulip Creek formations, all of Simpson age.

This well will go into the books as Oklahoma's first major strike of 1958. It is drilling ahead at the 12,000-ft. level now after the latest drill-stem test in the Tulip Creek at 11,000-11,164 ft. On this test, operator reported a flow of 56 bbl. per hour of 38°-gravity oil; cores had shown about 90 ft. of effective Tulip Creek pay. On earlier tests, the wildcat had flowed 66 bbl. per hour of 39° oil from the first Bromide sand at 10,739-10,814 ft., and 40 bbl. per hour plus heavy gas flow from the second Bromide at 10,854-10,944 ft. As a result of these tests, reserve estimates of 50,000 bbl. per acre were flying through the Oklahoma air last week. Gulf holds a block of 2,500 acres around the strike.

In a pattern of faults . . . This discovery was located on the basis of geophysical interpretations of a complicated pattern of faults which is believed to dissect the area into individual reservoir blocks. It lies only 3 or 4 miles southwest of the Payne-Northeast Payne fields where similar structural conditions have been found to exist. In that area, two discovery wells only a mile apart found a 700-ft. difference in depth to top Viola; different oil-water contacts in the two wells (both producing from the same Bromide sand) cinched the structural separation theory.

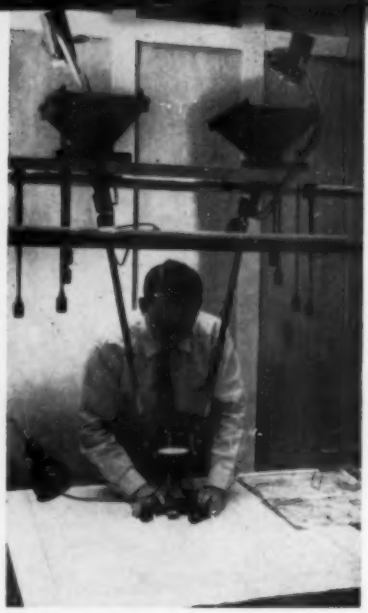
The Beard discovery topped the first Bromide at 10,713 ft., the second Bromide at 10,800 ft., and the Tulip Creek near 11,000 ft.; the Bromide sands thus ran about 1,100 ft. lower than in the discovery well of Northeast Payne field, 3 miles north.

Spreads flame to the west . . . This deep Ordovician play is expanding slowly and surely over southwestern McClain and northwestern Garvin counties. It actually began in 1955 with scattered Simpson discoveries in 4-5n-2w. But with the prolific Gulf 1 Dyer completion in Section 20-6n-3w in mid-1956, the flames began to spread to the west; the Dyer flowed 336 bbl. daily from Hunton and, dually, 1,496 bbl. daily from first Bromide. Five months later, two more flush strikes were made almost simultaneously. These, the Goff-Leeper 1 Little (Section 4-5n-3w) and the Weimer & Fitzhugh 1 Hanley (Section 5-5n-3w) were multipay discoveries. The Little well made 126 bbl. a day from Hunton and 745 bbl. a day from Bromide and Tulip Creek, while the Hanley made 480 bbl. from Hunton and 780 bbl. from first Bromide.

The Beard discovery pushes the play farther south and west. What it will find in Lower Ordovician is yet unknown, but certainly it's Oklahoma's latest bid for major exploratory attention. And it's a banner sendoff for 1958.

Seismic surveys today are an expensive method of finding oil, but, if successful, the results justify the expenditures.

Surface geology is an inexpensive method of mapping, but it is best used in foreign areas rather than the United States.



Aerial photography can cover an area at a cost of only 1 cent per acre. It can be coupled with an aerial magnetic study.

What Price Oil Exploration? Here are some interesting price-tag comparisons of the various methods

By C. T. Jones
Consulting Geologist, Tulsa

THIS SUMMARY compares the time required to complete a survey of a given area by some exploration methods. Since time is a factor in expense, the article also presents a comparison of some much more important and interesting cost figures. The methods to be discussed are:

1. Surface magnetics.
2. Airborne magnetics.
3. Surface geology.
4. Gravity.
5. Seismograph.

For the purposes of this comparison, I want to establish a unit area for use as a laboratory. Let us therefore choose an average area in the Four Corners country of Arizona, Colorado, New Mexico, and Utah of 1,800 sq. miles, where half of the unit is extremely rough terrain but where the other half is comparatively level and more accessible. Due to the great amount of current exploration activity in this region, we are able to develop rather contemporary operational data, and we do not have to extrapolate costs during a span of inflationary economy.

Another factor to thoroughly understand is the program required for any successful exploration method. Here I am placing myself in the position of an exploration manager who asks himself, "How close should my control be, considering what I want in the way of data in the end result, and the cost of procuring these data?" The program I am assigning as my requirement for any given exploration method to be successful is what I want as a minimum coverage or density of control. I realize I may not be able, because of topography or just not having enough time or money, to get such coverage, but I want it.

Here are the figures to be compared:

TIME (WORK DAYS)

Tools—	Field (days)	Compilation	Total (days)
Surface magnetics	150	current	150
Airborne magnetics	10	50 days	60
Surface geology	360	current	360
Gravity meter	150	nominal	150
Seismograph	2,520	nominal	2,520

and:

COST (DOLLARS)

Surface magnetics	$12,300
Airborne magnetics	13,500
Surface geology	29,000
Gravity meter	48,000
Seismograph	$4,000,000

For the purposes of this comparison, I am assuming that my requirement on desired density will be met.

Magnetics . . . For a ground magnetic survey, I want at least a station per square mile or 1,800 stations. In the laboratory area, the operator will occupy an average of 12 stations per day. The job will take 150 work days. If it costs $1,800 per month, which includes field, office, and overhead charges, each work day will cost in the order of $82 and the expense per station occupied will be almost $7.00.

In the airborne survey, the magnetics will be continuously recorded through approximately 2,000 linear miles of flying. Magnetics control points will be established at a density of one or more per square mile. The job can easily be flown in 10 days, and delivery of all data and maps can be promised in 60 days. The cost per square mile figures $7.50 with a nominal additional charge for photography.

Gravity work . . . I want a minimum of one gravity station per square mile for the survey; theoretically this is

only about 25 per cent of the density generally desired. The crew would average 12 stations occupied per day and could complete the unit area in 150 work days. Average monthly crew cost, including office and supervision overhead, is in the order of $7,000 so cost per work day figures $320, each station having a unit cost of $27.00.

Surface mapping . . . In surface geological mapping, I want the party to obtain an outcrop shot at least every half mile, density being three stations per square mile. The party should average 5 sq. miles per work day and such an area should be done in 360 days. Assuming a party cost of $1,750 per month, the work figures $80 per work day or $16 per square mile.

Seismic survey . . . With ¼-mile spreads on a 1-mile spacing pattern, 12,600 profiles would completely cover the unit area. At an average of five profiles shot per day the job would take 2,520 work days. Using a crew cost per month of $35,000, the cost per each work day calculates $1,600 and each profile $320. If we arbitrate our desired coverage of the unit area from my figure of 2,520 days at a total cost of almost $4,000,000 to even 10 per cent of that density, the seismic work will still require almost a year to complete at an estimated cost of almost $400,000.

Now after the presentation of these comparative figures and the factors used in their estimation, I should draw conclusions as to what method gives an operator the most usable service for his money.

The answer is simply that it depends entirely on the situation. These figures should be of interest and service to the oil finder. I consider them with frightened and mixed emotions. Each time I have an opportunity to work with them, figure on a job or do some consulting for a client, I hear a secret inner voice whispering, "Like the automobile industry, you may price yourself out of a market!"

My answer is that, first, the service organizations selling exploration methods are in the same shape as the owner of a barrel of crude. It's been a long time between raises! Next, these services continue doing their share toward finding new oil reserves not only in the Four Corners area but in the rest of the free world. Finally, oil exploration today in the search for substantial reserves requires more vision, more fortitude, and more money than ever before.

Photogeology

provides oil hunter with valuable data . . . and fast

By Eugene M. Shearer

Consulting Photogeologist,
Knox • Bergman • Shearer, Denver

"Six dollars per square mile or 1 cent per acre is a generalized evaluation cost . . . In many areas reconnaissance photogeology is entirely adequate for delimiting areas of favorable surface geology."

PHOTOGEOLOGY plays an integral part in many oil-exploration programs throughout the United States. This is particularly true in the Rocky Mountain area where more data can be gleaned from photogeologic evaluation than in other parts of the United States. Photogeologic studies can be divided into two groups: reconnaissance evaluations and detailed compilations.

Reconnaissance photogeologic evaluations, conducted by use of pocket or mirror-type stereoscopes, make use of materials such as vertical air photographs, aerial mosaics, and base maps. The costs for these materials are essentially a fixed cost item for photogeologic evaluation. Other expenses that influence compilation of reconnaissance photogeologic studies include reproduction costs, field check expenses and the professional fee for photogeologic evaluation. These factors are all subject to variation, hence the cost for this type of geologic study must be generalized. Six dollars per square mile or 1 cent per acre is a generalized evaluation cost that includes all of the aforementioned charges. Geologic mapping that results from this expenditure usually shows a detailed description of areal geology as well as a considerable density of structural data. In many areas reconnaissance photogeology is entirely adequate for delimiting areas of favorable surface geology.

High-order stereoplotting instruments have recently been adapted to geologic use in field mapping. With this equipment a properly trained photogeologist can compile surface structural contour studies from vertical air photographs. Evaluation costs are highly variable for these studies and the two primary factors that influence expenditures are the complexity of geology and the availability of ground control. Without specific knowledge of an area it is almost meaningless to approximate a cost per square mile charge for stereostructural contouring. However, contemplation of this type work must be accompanied by some over-all figure that may provide a clue as to the cost of these detailed studies.

Generalization of the variables in this process allows a cost estimate of three to eight times the previously mentioned cost for photogeologic reconnaissance, or roughly 3 to 8 cents per acre. In addition to the professional fee this cost estimate includes a variety of materials such as contact prints, enlargement of contact prints, diapositive plates, ground control data, reproduction charges, and field work for both ground control and geologic purposes.

Reconnaissance photogeology and stereostructural contouring combine to form an ideal one-two punch for oil and mineral-exploration programs. The low-cost reconnaissance studies can be used to determine favorable areas for detailed contour compilation through use of high order stereoplotting instruments. A twofold photogeologic approach such as this arms the exploration geologist with data of considerable importance as regards the determination of further exploratory applications.

EXPLORATION HIGHLIGHTS

Northern Alberta has oil strike as

New Well Is Added To Red Earth Creek

Union Oil Co. of California has struck flowing oil at another test in the Red Earth Creek area of northern Alberta, 215 miles north of Edmonton, and 6 miles northeast of the closest previous production in the area. The discovery of oil in this area during the late winter of 1956 sparked one of the most tense land rushes that western Canada has ever experienced, which involved something like 30,000,000 acres in the northern sectors of Alberta and Saskatchewan. This Granite Wash play has been carried out primarily by Union Oil Co. of California who now has six indicated oil completions in an area 8 miles in length. Whether or not the newest of those will turn out to be commercially successful remains to be seen, as well as the oil recovered during the drill-stem test a slug of salt water was contained in the drill pipe upon the completion of it.

The new venture, Union 4-20-88-7 Red Earth, is being drilled on LSD 4, 20-88-7w5. It lies 6 miles northeast of the 2-4 Red Earth success, 3 miles east of the 2-22 Red Earth wildcat abandonment, and 8 miles northeast of the original 12-17 Red Earth discovery hole.

Drill-stem test in the horizon, that was topped around the 4,970-ft. level, which indicated discovery was run of a 33-ft. interval below that depth. An oil flow was apparent 75 minutes after the valve had been opened and during that time, as well as another 3 minutes that it remained open, 3,065 ft. of oil and 1,135 ft. of salt water entered the drill-stem.

Like the original discovery, and other subsequent successes, the acreage on which they were drilled is wholly-owned by Union and involves a large tract in Petroleum and Natural Gas Reservation form.

Cardium Strike Reported West of Red Deer

A Cree Oil of Canada, Ltd., exploratory test being drilled by itself, Supertest Petroleums, Ltd., The Calgary & Edmonton Corp. and Medallion Petroleums, Ltd., on acreage acquired under farmout agreement from the Home Oil Co., Ltd., group in the Butte area of central-west Alberta, has indicated crude oil and natural gas success from the Cardium sand during a recent drill-stem test. The well lies 35 miles west of Red Deer in quite an active exploratory and development region, that boasts such finds as Leslieville, Leafland, Gabriel Lake and Bentley, just naming a few. The most recent, however, is quite unknown from a commercial point of view and only further testing of the structure will answer that. Actual rates obtained during the drill-stem test ranged up to 1,040,000 cu. ft. of gas per day along with a fine spray of oil. Pipe recovery upon completion of the evaluation was 90 ft. of distillate-cut mud.

This venture is known as, Cree-Supertest-Home 10-20 Butte, on LSD 10, 20-38-5w5, and it is 6 miles south by east of the Mobil Oil 4-19 Leslieville Viking and Blairmore oil discovery well. Another venture drilled by this team which failed to indicate commercial production, meanwhile, lies 5 miles due south.

It is being drilled as a test of the Mississippian formation and crew of the drilling rig employed on the well was making hole below the Cardium sand at last report on its way to that lower objective. It is not known whether the team plans any further work in this discovery horizon, but that will be borne out after total depth is reached.

Hope for the Hudson's Bay Oil & Gas Co., Ltd's., 7-34 Lomond test, which through core and log information obtained from the Mississippian horizon had indicated a highly porous and oil-stained section, is fast diminishing according to further reports obtained on the well. Initial swab test, reported last week, in a porous sector above what was thought to be the main pay zone, showed a flow of salt water. That interval was squeezed and a lower set of perforations were opened and acidized. Much the same results were obtained through them, however, as in addition to a small amount of load oil used, 500 bbl. of sulfurous water, cut 5 per cent by crude was recovered. Again those openings are being squeezed with cement and according to another report, an interval between the two already tested, will be opened and evaluated.

Lomond No. 7-34, was drilled on LSD 7, 34-16-20w4, 65 miles southeast of Calgary, and first indications were that a 68-ft. net pay sector was present which contained 16 per cent porosity and was oil-stained, however, unless the next tested interval produces the hope-for results the well will probably be finished.

APPALACHIAN

EASTERN KENTUCKY

Big Sandy Field Well Completed

In the Pike County sector of Big Sandy gas field, Kentucky West Virginia Gas Co. have completed 6380 M. W. Remines as a Big Lime (Mississippian) oil well. Located on Sycamore Creek of Elkhorn Creek test failed to find commercial gas volume in the Devonian black shales to a total depth of 4,362 ft. Hole was then filled back to 3,188 ft. and well completed for 10 bbl. daily from interval 3,145 to 3,151 ft. Top of Big Lime was 2,882 ft.

PENNSYLVANIA

Rank Test Slated In Somerset County

In Jefferson Township, Somerset County, Southwest Pennsylvania, Peoples Natural Gas Co. has announced location for a deep, rank wildcat test. It is 1-4166 Pennsylvania Department of Forest and Waters, elevation 2,461 ft., Donegal Quadrangle, 2.97 miles south of latitude 40 degrees .05 minutes and .87 mile west of longitude 79 degrees 15 minutes.

- Buffington Township, Indiana

EXPLORATION THIS WEEK

Canada	146
Appalachian	146
California	147
Kansas	147
Louisiana	148
Arkansas	148
Illinois Basin	148
Michigan	148
New Mexico	148
North Dakota	148
Rocky Mountains	149
Oklahoma	149
Washington	152
Texas	153

County, Columbian Carbon Co. 1-1848 Herman George shut down in the chert at 8,130 ft. to cement.

• In Washington Township, the rotary tools are rigged up and ready to start from the depth of 1,020 ft. in 1-1842 Jessie Fairman.

OHIO

Fourth Well Started At Ashtabula Discovery

Benedum Trees Oil Co. reports that the second well in new Conneaut field in Monroe Township, Ashtabula County, made 60 bbl. per day at 3,420 ft., the third well in the field is nearing pay sands, and the fourth well has started. The discovery well in this area is making about 40 bbl. per day.

Reports state that about 75,000 acres of farm land in Ashtabula County have been taken under lease by more than a dozen companies since the discovery of oil last fall at the 1 Scribner discovery.

Reports also state that drilling is under way at several operations across the state line in Pennsylvania. The Scribner discovery got its oil in the Medina, and is considered one of the most significant strikes in the East in 35 years or more.

Another Good Well Finaled In Walhonding Pool

Another good well was completed by Preston Oil Co. along the north edge of the Walhonding pool in New Castle Township, Coshocton County. Their 1. L. D. Hafner, 2nd Qr., logged Clinton sand at 3,214-71 ft. and made 250 bbl. in a 24-hour test after fracture.

North Extension Added To Turkey Foot Pool

East Ohio Gas Co. brought in a north extension to Turkey Foot pool in Franklin Township, Summit County. Their 1 H. W. Woodhall, Section 8, gaged 1,400,000 cu. ft. after fracturing Clinton, found at 3,915-45 ft.

Reese Pool Grows With Two New Wells

Two outside locations by Willard Shrider show an expansion of Reese pool in Coshocton County. The 1 Knox, Section 5, Jefferson Township, filled 1,200 ft. in 40 hours from Clinton at 3,322-80 ft. while the 2 Mullett, Section 21, Tiverton Township, gaged 700,000 cu. ft. with a good oil showing in Clinton at 3,335-96 ft.

CALIFORNIA

New Pool at Oxnard

Max Pray, operator, continued the 2-year record of new pool discoveries in the Oxnard field are of Ventura County with a 740 bbl. daily find 1 mile south of the nearest field producer. The Pray wildcat, 1 Max Pray-Donlon, was completed in a Sespe interval at 7,745-67 ft. After being brought in, it was choked back to 528 bbl. daily of 32.7°-gravity crude.

Honolulu Turns Up New Gas Pay at Compton Landing

Honolulu Oil Corp. moved 1¼ miles southeast of the nearest Compton Landing Gas field producer in Colusa County and found a new gas pool in a 35-ft. sand section at 2,450-85 ft. The well was put on production making 1,250 M.c.f. daily of natural gas through a 19/64-in. choke. The new discovery has been labeled Hamilton Bend pool of Compton Landing field.

Standard Gets Big McGrath Pool Well

Standard Oil Co. of California, Western Operations, Inc., has completed 5 McGrath in McGrath pool of the deep West Montalvo field, Ventura County, as one of the field's best producers to date. Standard-Western took the well to 12,700 ft. total depth and completed it in six selectively perforated intervals at 11,553-66 ft., 11,584-11,604 ft., 11,820-46 ft., 12,175-91 ft., 12,218-33 ft., and 12,248-52 ft. It flowed 984 bbl. daily of 19.9°-gravity crude through a 1-in. choke initially.

Universal Completes Well on Movie Lot

Universal Consolidated Oil Co. completed 16 20th Century-Fox, on the film company's west Los Angeles movie lot making 36 bbl. daily of 60°-gravity crude and 1,375 M.c.f. daily of gas through a 12/64-in. choke.

The oil company's other rig working on the movie lot was redrilling 2A Community at 6,301 ft. after plugging it back from 8,039 ft. This is the second redrill on this test—the original hole was taken to 8,494 ft. and then plugged back and redrilled to 8,039 ft.

First 1958 California Field Find in the Making

Standard Oil Co. of California, Western Operations, Inc., was on the verge of what gave excellent promise of being California's first new field discovery for 1958 with a wildcat 2 miles east of West Montalvo field. The wildcat, 1 H. O. Borchard, reportedly flowed at a rate of 1,200 bbl. daily of crude on a formation test of an interval at 10,820-10,900 ft. The test is in SE SE 21-2n-22w in western Ventura County. Standard - Western was drilling ahead below 11,620 ft. following the formation test with the programed total depth unknown at this point.

KANSAS

Casing Set at New Clay Prospect

Pure Oil Co. has set casing at an indicated Clay County discovery in eastern Kansas, 1 mile south of Griffith pool. The 1 Hollen "A," SW SW NE 10-9s-4e, 5 miles northeast of Wakefield, found oil in the Mississippi at 1,880-1,914 ft. on tests.

Simpson Oil Flows at New Sumner Strike

Shawer-Armour Drilling Co. and Wilcox Oil Co. 1 Sydell, SW SW SE 17-30s-1e, 1 mile southwest of West Bellman pool in Sumner County, flowed 40 bbl. of oil natural. Production is from Simpson open hole at 3,826-36 ft. The operators are waiting for state potential at this new strike which is 4 miles northwest of Belle Plaine, Kans.

New Strike Hinted At Comanche Wildcat

Capitt Drilling Co. and Oil Trading Corp. are testing at the 1 Robinson in NE NW NW 5-31s-18w, ¾ mile northwest of Mule Creek field in Comanche County, southwestern Kansas.

A drill-stem test in the Mississippi got 540 ft. of very heavily oil-cut mud and another one recovered 280 ft. of heavily oil-cut mud and 270 ft. of gassy oil. The tests were made at 5,026-66 and 5,066-90 ft.

Mississippian Oil Found At Harper County Test

Aurora Gasoline Co. has a new discovery well in western Harper County at the 1 Hoyt, NW NW NW 16-32s-8w, 3 miles southeast of Spivey-Grabs pool and 2 miles northeast of the town of Attica.

Recovery from the Mississippi at 4,359-75 ft. was 1,580 ft. of oil. Another test at 4,379-95 ft. got 3,330 ft. of gas, 165 ft. of oil and gas-cut mud, 80 ft. of oil-cut salt water and 60 ft. of salt water. There were also shows in the Marmaton lime.

ARKANSAS

Gas Field Opened in Johnson County

Gulf Oil Corp. opened an Atoka-Pennsylvanian gas field in southeastern Johnson County, northwestern-central Arkansas at its 1 W. H. Tackett, C SW NE 2-8n-22w, 3 miles east of Knoxville.

The well, opener of Knoxville gas field, flowed 8,000 Mcf. of gas per day on calculated open flow from perforations at 3,308-72 ft The well is 15 miles west of Moreland field and 6 miles southwest of Tates Island field. Those two gas areas are in Pope County.

ILLINOIS BASIN

INDIANA

Gibson County Discovery Is Benoist Producer

C. E. O'Neal & Co. et al 2 Brittie E. Bush Unit, SW SE SW 28-2s-11w, Gibson County, is on pump as a Benoist sand producer at 2,195-2,209 ft. The operators swabbed 20 bbl. of oil hourly following fracture. Location is 5 miles southwest of Princeton, Indiana.

LOUISIANA OFFSHORE

New Pay Discovery Seen

Initial production tests by Kerr-McGee Oil Industries, Inc., et al, indicate successful completion of 14,000-ft. offshore well in a new commercial horizon.

A report said in this well 16 other sands all apparently carrying gas condensate were encountered below 8,600 ft. to its total depth of 14,175 ft. indicating a total of 490 ft. of gas-condensate pay.

The well is the State Lease 750 (OCS-0346) F-1, located in Block 28 of the Ship Shoal area, off Terrebonne Parish, Louisiana. Its location is 1,980 ft. west of the A-1 well. When the A-1 well was drilled by Kerr-McGee and others in 1947-48, a massive gas and condensate sand was encountered at 13,973 ft., but the well was completed as a gas-condensate producer at 8,500 ft.

In a several hour test on a 14/64-in. choke, the F-1 well flowed gas at the rate of 4½ million cubic feet per day, with 70 bbl. of condensate per million cubic feet. Flowing tubing pressure was 4,725 lb. and corrected gravity of condensate 54.2°. Depth of the sand is 14,078 to 14,146 ft.

Partners with Kerr-McGee in the joint venture are Phillips Petroleum Co. and Southern Natural Gas Co.; Pan American Petroleum Corp. also has an interest in Block 29.

Early development of this field is contemplated officials said.

NORTH

Extension Finaled at Sibley in Webster

Butler-Johnson, Inc. and Associates have completed 1 Braswell et al in C NE NE NW 8-17n-9w, as a ¾-mile southwest extension to Sibley field in Webster Parish.

The well flowed 2,000 M.c.f. of gas per day plus 18 bbl. of distillate on 14/64-in. choke from the Jeter sand. Perforations were at 5,650-56 ft.

New Pay Discovery At Carterville

Nebo Oil Co., Inc. 89 Nebo Fee, Carterville field in Webster Parish, is a new-pay strike for the area. The well flowed 52 bbl. of condensate per day plus 3,180 M.c.f. of gas on 11/64-in. choke from perforations in the Smackover "B" lime at 11,041-54 ft. The well is also a producer from the "A" zone at 10,838-44 and 10,850-72 ft. From this zone it made 124 bbl. of condensate and 3,300 M.c.f. of gas daily on 13/64-in. choke. Nearest Smackover production is just northeast in 15-23n-11w.

ILLINOIS

Saline Discovery Put on Pump

Hal S. Lobree 1 Jess Clarida is an Aux Vases sand discovery in SE NE SE 20-8s-5e, 4 miles southwest of Galatia.

The operator is putting the well on pump after swabbing 10 bbl. of oil per hour from 2,899-2,915 ft. following fracturing.

MICHIGAN

Year Turnover Exploration Slowed Down By Holidays

The combination of holidays and blizzards all but idled the Michigan oil industry at the turn of the year. Two wildcats held special interest.

Miller Brothers 1 Harmon SW SE SE 10-17n-17w, Mason County, was swab testing after 1,000 gal. acid treatment to Traverse zone pay, logged at 1,650-52 ft. Test recovered 35 bbl. net in 2 days after treatment. Traverse was logged at 1,647 ft., and hole bottomed at 1,667 ft. for test. Wildcat is located 5 miles north of Pentwater oil field.

• McClure Oil Co. 1 Gable NE NE SW 8-10n-2w, Gratiot County, logged Traverse lime at 2,668 ft. and carried good show oil at 2,719 ft. Drilling was halted to test. Location is 14 miles east Crystal oil field.

NEW MEXICO

NORTHWEST

Dakota Gas Strike Finaled in San Juan

Lion Oil Co., a division of Monsanto Chemical Co., has completed the 1 Vierson as a gas discovery well in San Juan County, New Mexico.

The wildcat tested 6 million cubic feet of gas per day through a ½-in. choke, with flowing tubing pressure of 940 lb. Total depth was 6,240 ft. with completion in the Dakota formation through perforations from 5,974 to 6,070 ft.

The discovery well is located 6 miles northwest of Farmington in 19-30n-13w.

NORTH DAKOTA

Rocky Ridge Confirmation Well Flows Oil

Northern Pump Co. 3 Fritz, confirmation well to the Billings County Heath discovery of just exactly 1

year ago, flowed oil at the daily rate of 132 bbl. from a 5-ft. perforated section of Heath sand. Perforations were at 8,123-28 ft. More tests are due before completion. Perforations will be made at 8,113-23 ft.

This confirmation strike has an estimated 60 ft. of pay in two Heath sand sections. It lies northwest of the field discovery well completed early in 1957 as one of the exploratory highlights of the year for North Dakota.

New Field Opened in McKenzie County

Amerada Petroleum Corp. 1 Kennedy, C NW NE 29-15n-96w, is a new Madison-Mississippian discovery for McKenzie County. The well was completed flowing 374 bbl. of oil per day from Madison perforations at 8,995-9,034 ft. on 12/64-in. choke.

The new field-opener is on the west flank of the Nesson anticline. Location is 5 miles west of Blue Buttes field and 2½ miles north of Fancy Buttes field.

Discovery Reported at Renville County Well

Renville County in northern North Dakota apparently has a new discovery at Anschutz Drilling Co.'s 1 Christensen, C NE NW 7-158n-81w, 23 miles southwest of production at Newburg field.

A test at 4,466-79 ft. in what is thought to be the lower Mission Canyon-Mississippian recovered 1,000 ft. of heavily gas-cut oil and 90 ft. of slightly mud-cut and heavily gas-cut oil. Another test at 4,479-99 ft. got 180 ft. of oil and gas-cut mud, 180 ft. of heavily oil and gas-cut mud, and 270 ft. of free oil.

ROCKY MOUNTAINS

WYOMING

Wyoming Gets New Depth Record

A new producing-depth record has been set for Wyoming and the entire Rocky Mountain province. The new record-breaking well is Pure Oil Co. 1 Badwater Unit, SE NE NW 35-39n-89w, Natrona County. It was completed flowing 5,500 M.c.f. of gas per day from upper Cretaceous perforations between 15,216 and 16,472 ft. on ½-in. choke.

Pure has shut in the discovery well. The Badwater Unit is in northwestern Natrona County and 6 miles from any previous drilling activity.

OKLAHOMA

Three Pennsylvanian Hits

Panhandle Eastern Pipe Line Co., natural gas transmission line and producer of natural gas and oil, announced three recent oil discoveries in Oklahoma.

The Panhadle 01 Reiss well is a rank wildcat discovery located in C NW NW 11-5n-10eCM, Texas County. An official state test flowed 648 bbl. of oil and 4,060,000 cu. ft. of gas daily. Panhandle has under lease in sections immediately adjacent to the 01 Reiss approximately 3,500 acres The well was perforated in the upper Morrow sand from 4,456 to 4,470 ft.

• A second discovery is the 02 Easterwood, located in the C SE SE 11-4n-13eCM, Texas County. On a preliminary test this well flowed at the rate of 10 bbl. per hour from lower Morrow sand perforations, 6,409 to 6,413 ft. The Easterwood was drilled as a wildcat approximately 2 miles north of Panhandle's Wilson oil discovery of a year ago. This well is located on a block of 35,000 acres under lease to Panhandle.

• The third significant Panhandle discovery is the 02 Keenan, located in the C NW NE 26-4n-13eCM, Texas County. This is in North Unity Oil field just south of Panhandle's Wilson well and is near the center of Panhandle's 35,000-acre Texas County block known as the Fox Block. This well was state tested at 1,290 bbl. of oil a day through lower Morrow sand perforations, 6,454 to 6,466 ft.

Third Inside Hugoton Morrow Field Opened

The year-end completion of Cities Service's third significant Morrow sandstone gas well in Texas County, Oklahoma, confirms deeper pays under parts of the shallow Hugoton gas fields.

The deeper pay was first indicated in Cities Service's 1 Murdock test in the center NE SW 10-4n-15eCM, when commercial gas shows were indicated in Morrow sandstone tests. Completion of this test was held up pending information obtained from confirmation and test wells in the area.

Cities Service's confirmation to its Murdock discovery was completed for a calculated open flow of 205 million cubic feet of gas daily from Morrow perforations between 6,032 and 6,078 ft., after fracturing. The confirmation is A-1 Welch in the center NE SW 3-4n-15eCM.

Cities Service completed another Morrow test 5 miles west of the Murdock well. Completion was for a calculated open flow of 32 million cubic feet of gas daily. Flow was from Morrow perforations from 6,160 to 6,388 ft. The latest discovery is 1 Stelzer, center NE SW 11-4n-14eCM. In completing the Stelzer, the gas pay was not fractured.

Cities Service has 77,440 acres in the North Guymon block on which the two discoveries and the confirmation were drilled.

In Oklahoma Wildcatting

Significant Finds Made

Every section of Oklahoma got into the exploratory game in 1957 with some of the most significant and rank wildcat discoveries in the state's long oil history. A rundown on the most important strikes by counties:

Alfalfa County . . . This northern Oklahoma county continued to see expansion of the Cherokee Pennsylvanian trend that began in 1956. The most important single strike in the county was Davon Oil Co.'s Cherokee find in 30-27n-10w. This well made 420 bbl. of oil per day on small choke and was quickly developed into an important new pool.

Beaver County . . . This Panhandle county continued to expand its Pennsylvanian and Mississipipan oil and gas reservoirs. Focal points of greatest interest were Highland and Camrick. Production at Highland was found in the Hoover, Tonkawa, Checkerboard, Morrow, and Chester. Some of the gas we'ls here made more than 50,000 M.c.f. per day. The field now is nearing linkup with Harper County's Laverne district to the east.

Beckham County . . . Shell Oil Co.'s 1 Boyd Springer discovery in NW NW 15-9n-22w flowed 21,000 M.c.f. of gas per day and 400 bbl. of distillate

to move Springer production to its westernmost point in Oklahoma. The second well in the new pool found still another pay zone.

Cimarron County . . . This westernmost of the Panhandle counties had two centers of attraction last year . . . Keyes field, which continued to grow with high flowing gas wells, and the new field in the Griggs area, southeastern Cimarron County. The Texas Co.'s strike in the southeast corner of the county found six separate pays. The well was completed dually, however, in the Atoka and Morrow for more than 10,000 M.c.f. per day.

Caddo County . . . East Cement is the center of wildcat interest in this southwestern county. The well is Pan American Petroleum Corp. 1 Williams, NW NW 1-5n-9w. The Springer discovery flowed 8,000 M.c.f. of gas per day on drill-stem test at 14,500 ft. The strike should set off new Springer interest in this deep part of the Anadarko basin.

Cleveland County . . . This central Oklahoma county was one of the busiest in the state. Ordovician discoveries in this county stimulated development and exploratory work throughout the year. One of the most active Ordovician areas was at Noble townsite.

Dewey County . . . First production was opened here in 1957. The discovery well was Sinclair Oil & Gas Co.'s 1 Kunc in SW NE 11-17n-18w. The Oswego lime well flowed 103 bbl. per day plus 3,000 M.c.f. of gas; from the Cherokee it made 1,356 M.c.f. per day.

Ellis County . . . Production was revived in this far western Oklahoma county last year. The new area that brought the drill back to Ellis is Catesby, a Shell Oil Co. discovery. Production is from Morrow sand. At year's end there were two other discoveries in Ellis.

Grady County . . . The Carter-Knox ultradeep play was the exploratory highlight of the year in Oklahoma. Several deep wells were completed in the Ordovician sands, one of the state's deepest producers, British-American 1 Krieger on the Stephens County side of the play.

Grant County . . . This sister county to Alfalfa in the north part of the state added further wells to the Cherokee trend.

Harper County . . . This northwestern area was one of the most active pre-Permian areas in the Anadarko basin. Southeast Stockholm field was the discovery highlight of the year where an extensive Tonkawa sand oil pool was developed.

McClain County . . . This south-central county gained several important Ordovician and Pennsylvanian pools, with more promised in 1958.

McIntosh County . . . A prolific gas discovery by Oklahoma Natural Gas Co. in 17-10n-13e brought this southeastern county into the spotlight in 1957. Production came from Gilcrease and Cromwell sands. The well flowed 10,000 M.c.f. of gas per day. Other gas strikes in the area give eastern Oklahoma a new importance in wildcatting.

Marshall County . . . The Madill-Aylesworth area had several important new pays and new wells during the year. An important Ordovician discovery was made in 24-5s-5e by Jones Oil Co.

Major County . . . The most important strike here was an addition to the "Woodward Trend" 30 miles west of Ringwood field. Pan American found gas in the Cottage Grove sand of

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Pennsylvanian age at 6,209-29 ft. The well flowed 14,245 M.c.f. open flow with some distillate to give the trend its eastern anchor.

Texas County . . . Deep, inside Hugoton gas field, Pennsylvanian discoveries reached their zenith in this Panhandle county in 1957. Some of the biggest gas we'ls in Panhandle history were completed in the Camrick, Hardesty, and Unity areas, all inside the limits of Hugoton gas field production.

Woods County . . . The most significant strike in this northwestern county was made by Amerada in 24-25n-13w. The second Wilcox well flowed 17 bbl. of oil per hour. Later, Osage-Layton gas production was added to the field.

Woodward County . . . Pennsylvanian gas and gas-distillate discoveries in this northwestern county opened an entire new oil and gas province for Oklahoma. The first pool was opened in 1956, but 6 new fields came onto the scene in 1957. Champlin Refining Co. opened a pool in SE NW 1-22n-21w, near Woodward, She'l Oil Co. found Chester gas in 23-22n-17w, Sinclair got Morrow gas near Woodward in 1-23n-20w, and Pan American opened the county's first oil production in 3-21n-21w. The small oiler made 48 bbl. of oil per day. The new so-called "Woodward Trend" was the biggest news in northwestern Oklahoma in 1957 and promises to grow in importance in 1958.

Survey Releases Subsurface Stratigraphic Names

The Oklahoma Geological Survey Guide Book No. VI, Subsurface Stratigraphic Names of Oklahoma by Louise Jordan, is now available.

In December 1954 a preliminary list of Oklahoma subsurface stratigraphic names compiled by Carl C. Branson and issued in The Hopper in the hope that information about the names and the named units would be elicited from geologists. A great deal of new information, of corrections, of additional names, and of other data was sent in by men who are familiar with local nomenclature and with early nomenclatorial history.

The earlier list was issued with the surface names omitted, even those widely used in subsurface. Many geologists have criticized the omission, and since this publication is printed primarily for the use of subsurface geologists, surface names used exten-

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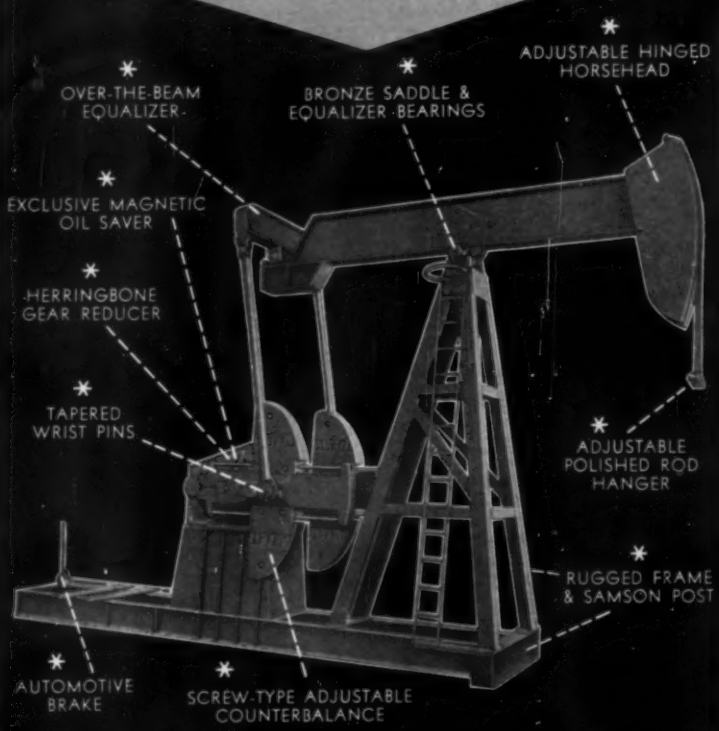

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sively in subsurface are here given with a brief discussion of each.

A typical discussion of a famous Oklahoma pay sand in this publications runs thusly: "Bartlesville sand . . . first reference—Hutchison (1911), OGS 2, p. 186. Named for the city of Bartlesville, Washington County. Discovery in Cudahy Oil Co. 1 Nellie Johnstone, NE NE NE 12-26n-12e, at 1,303 ft., Bartlesville field, Washington County.

Term used in Central and Northeast Oklahoma for sand below Inola limestone and above Savannah "Brown Limes." Fine to medium-grained discontinuous sandstone."

Typical logs accompany the discussion of each pay sand in the book. This new guide book to subsurface stratigraphic names in Oklahoma is a big contribution to clearing up the stratigraphic "jungle" that has existed there and in many areas of the country.

NORTHWEST

Fourth Well Added To Northeast Catesby

Shell Oil Co. is adding the fourth producer to new Northeast Catesby field in northwestern Ellis County. The new addition is 1-30 Tubb, C SW NE 30-24n-25w.

The Morrow producer is flowing 5,000 M.c.f. of gas per day from perforations at 8,102-15 and 8,121-36 ft.

A southwest offset well is under way by Shell. It lies just 3 miles from the Beaver County line at the entrance to the Oklahoma Panhandle.

Small Discovery Finaled In Harper County

Pan American Petroleum Corp. has a small gas discovery southeast of Kibby in Harper County. The well is the 1-A Parker in C SE NW 26-26n-21w. Gas flowed from the Chester-Mississippian at the daily rate of 530 M.c.f. on ¼-in. choke from perforations at 6,352-6,446 ft.

Laverne District Expands to the West

The prolific and large Laverne gas district in Harper County moved about 2 miles west and is nearing linkup with Highland field of Beaver County in the Oklahoma Panhandle.

Union Oil Co. is drilling ahead below 4,795 ft. after finding gas in the Hoover sand at 1 Riggs, C NE SW 10-26n-26w, about halfway between the two fields. Successful completion of this discovery will move Laverne's limits near the Panhandle line.

Second Well Added to Northeast Woodward

Northeast Woodward field has its second producer at Sinclair Oil & Gas Co. 1 Withgott, C SE NW 2-23n-20w. The west offset to the field discovery well flowed 4,230 M.c.f. of gas per day on ½-in. choke. Perforations are at 7,562-84 ft.

SOUTHEAST

Significant Strike Reported In Coal County

The North Tupelo district of Coal County in southeastern Oklahoma is the scene of an important wildcat strike. Atmar Drilling Co. 1 LaFevers, SE SE NE 3-2n-8e, is being completed after finding 120 bbl. of oil per day on tests of the basal Oil Creek Ordovician sand. Operator plans to complete in the upper Oil Creek and basal Oil Creek dually.

The wildcat also had commercial production indicated in the Cromwell, the Trenton portion of Viola and Bromide.

WASHINGTON

Rattlesnake Hills Wildcat Quits

Standard Oil Co. of California, Western Operations, Inc., has abandoned drilling operations at its exploratory well in the Rattlesnake Hills of Benton County, eastern Washington. The wildcat well is located 20 miles north of Prosser in 15-11n-24e and was drilled to a depth of about 8,400 ft.

Company spokesmen stated that 6 months of slow but intensive drilling through unusually hard volcanic rock formations had revealed nothing of commercial significance. Expenditures to date on the well, exclusive of initial geological work and lease acquisition costs, total approximately $625,000. Numerous special techniques were employed in attempts to speed penetration and all available modern oil and gas detection devices were constantly in use to insure that nothing was missed.

The well, known as 1 Rattlesnake Hills Unit 1, was designed to test a large block of more than 100,000 acres.

The 1 Rattlesnake is the latest of three recent attempts by Standard to develop oil or gas production in eastern Washington and Oregon. None has been successful.

Drilling contractor was Miracle-Wooster of Vernal, Utah.

TEXAS

Garza Gets Thick Pay

Southern Garza County reported two wildcats showing for Pennsylvanian discoveries, one of which had a gross indicated pay section of around 200 ft., based on successful drill-stem tests.

The prospects are Shell Oil Co. 1-C Slaughter estate, 33-2-T&NO Survey, 9 miles south of Post, and T. M. Evans 1 Slaughter estate, 30-2-T&NO Survey, 12 miles south of Post.

Shell's test, until last week dril'ed tight, reported first oil in the Pennsylvanian at 7,857-72 ft. Recovery was 1 gal. of free oil and 1,500 ft. of heavily oil-cut mud. Maximum flowing pressure was 590 psi.

Next test, open 1½ hours at 7,882-7,902 ft., had gas in 5 minutes and unloaded oil whi'e pulling pipe. Total oil recovery was estimated at 35 bbl. Flowing pressure was up to 1,265 psi.

A 1-hour and 12-minute test at 7,904-32 ft. had oil in 12 minutes, and flowed slightly over 13 bbl. in 1 hour with no water. Flowing pressure was 2,985 psi.

A 1-hour test at 7,940-62 ft. had oil in 40 minutes at the rate of 38 bbl. an hour. Gravity was 38.7°.

At 7,962-97 ft., oil surfaced in 75 minutes, gaging 6.3 bbl. in 30 minutes. Thirty-minute shut-in pressure was 3,545 psi.

The tool plugged at 7,997-8,027 ft., but recovery was 2,900 ft. of heavily oil-cut mud.

A 2-hour test from 8,027-57 ft. had oil in 1 hour and 55 minutes, gaging 1 bbl. of oil in a 5-minute flow test. At last report another test was being run at 8,057-87 ft. Projected depth is 8,650 ft., which is expected to reach the Ellenburger. Location is about ½ mile northeast of the 1-well Teas-Spraberry poo'.

Strawn and Mississippian prospect . . . T. M. Evans 1 Slaughter had oil at the surface in 2 hours and 10 minutes while testing at 7,963-8,033 ft., tentatively called the Mississippian. It flowed an estimated 10 bbl. of fluid an hour to pits, being about 70 per cent oil. Fluid in the pipe was estimated at 1,500 ft. oil and 2,500 ft. salt water.

Perforations at 8,038-44 ft., identified as Strawn, were swabbed after acid treatment. Recovery was 20 bbl. of fluid an hour, said to be 15 per cent water and the balance new oil. Testing continued.

Gaines County . . . Jake L. Manon 1 Brennand, deep wildcat in southeastern Gaines County, reversed out 270 ft. of 39°-gravity oil and 800 ft. of oil-cut mud following a 3-hour drill-stem test in the Strawn at 11,220-11,308 ft. A second test at 11,308-40 ft. recovered 30 ft. of mud with no shows.

No. 1 Brennand drilled into the Strawn at 11,190 ft., minus 8,142 ft. Projected depth was 12,800 ft. Location is 21 miles southeast of Semino'e in Section 27, Block A19, PSL Survey. Nearest production is Glasco-Devonian field, 2½ miles to the west.

Terrell County Prospect Testing Ellenburger

Magnolia Petroleum Co. 1 Brown-Bassett plugged back from 15,556 ft., total depth, to 15,042 ft. and perforated a new section in the Ellenburger. The new holes at 14,634-14,734 ft. were swabbing mud when it kicked off and flowed into pits through 32/64-in. choke. Gas was

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gaged at 1,550,000 cu. ft. per day, under tubing pressure of 300 psi.

After acid treatment, the flow picked up to 7,300,000 cu. ft. through 16/64-in. choke, under flowing pressure of 2,000 psi. A later gage was at the rate of 2,200,000 cu. ft. per day, with pressure at 3,200 psi. Operators then perforated at 14,430-14,530 ft. for additional tests.

The 1 Brown-Bassett has been testing the Ellenburger for several weeks, from formation top at 13,742 ft. Elevation is 2,448 ft. Location is Section 218, Block Y, TCRR Survey, 39½ miles northeast of Sanderson.

GULF COAST

Deeper Wilcox Production Found at Nelsonville

New and deeper Wilcox production in the Nelsonville area of Austin County has been discovered by Falcon Seaboard Drilling Co.'s 1 H. F. Phillips. The gas and distillate producer also establishes a new eastern outpost for Nelsonville fie'd in a play sparked 6 months ago by Jack Frazier's 1 George Mikeska.

From perforations at 10,414-24 ft. and 10,456-74 ft. Falcon Seaboard's new well produced at the rate of 53.6 bbl. of distillate and 1.69 million cubic feet of gas per day through a 14/64-in. choke. Two additional sands uphole, not previously productive in the area, were also successfully drill-stem-tested, giving the well a proved net pay of 261 ft. plus another 114 ft. not tested but indicated productive by electric logs and side wall cores.

Falcon Seaboard's well is 2,000 ft. northeast of Frazier's 1 Mikeska which was dually completed last August. It tested a combined total of 252.8 bbl. of distillate and nearly 3,000 M.c.f. of gas daily through a 14/64-in. choke from two sets of perforations, the upper at 9,241-66 ft. and the lower from 9,591-9,616 ft.

Frazier's well reopened activity in Nelsonville field, where production was originally discovered in 1950 by the Sun Oil Co., and carried production 1,500 ft. southeast of what had previously been considered the field limits. His well also ran siginificantly higher than anticipated.

Falcon Seaboard is currently drilling the third test in the area, their 1 Fritz Schumann 2,500 ft. southeast of their 1 Phillips. It is at 5,585 ft.

Nelsonville fie'd is located some 7½ miles west-northwest of Bellville and 2 miles southeast of Nelsonville townsite.

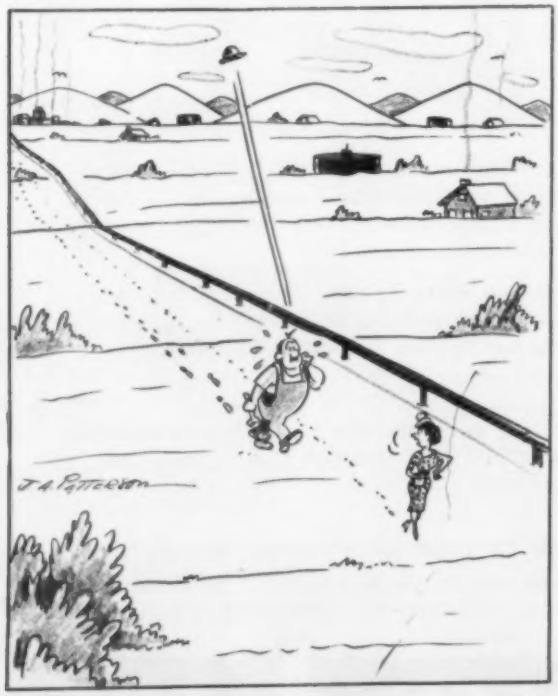
Three Wells Finaled In McFaddin Field

Sunray Mid-Continent Oil Co. has completed three new gas wells, all dual producers, in McFaddin field in Victoria County.

Three earlier completions bring to 32 the number of gas wells Sunray now operates in McFaddin field. The operator is contemplating further development of its properties in the field.

The three new dual producers, all in the CMB Hoyd Survey, A-179, Victoria County, include:

- No. 44 J. A. McFaddin, open flow potential of 14,800,000 cu. ft. a day from the 3,400-ft. sand with a shut-in surface pressure of 1,048 lb.; and 9,000,000 cu. ft. a day from the 3,200-ft. sand with a shut-in surface pressure of 1,030 lb. Total depth 5,062 ft.
- No. 43 J. A. McFaddin, open flow potential of 25,500,000 cu. ft. a day from the 3,400-ft. sand with a shut-in surface pressure of 1,046 lb.; and 16,300,000 cu. ft. a day from the 5,000-ft. zone with a shut-in surface pressure of 1,485 lb. Total depth 5,061 ft.
- No. 42 J. A. McFaddin, open flow potential of 11,300,000 cu. ft. a day from the Greta stringer sand



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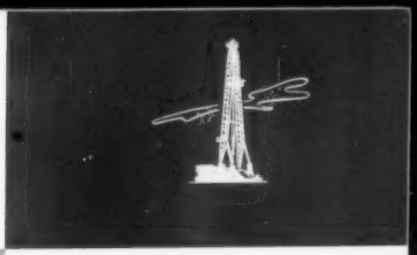

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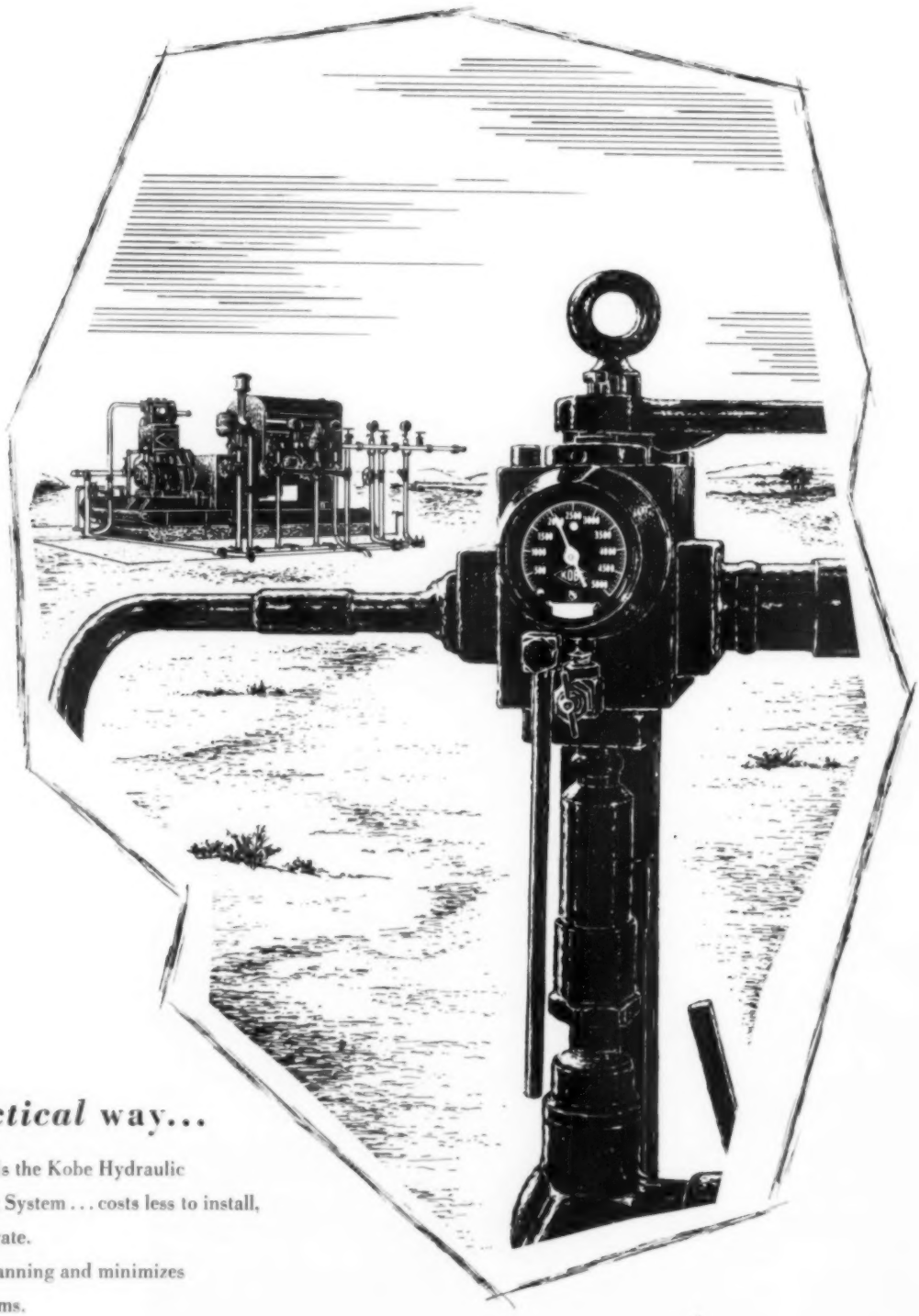

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with a shut-in surface pressure of 1,184 lb.; and 16,400,000 cu. ft. a day from the 2,900-ft. sand with a shut-in surface pressure of 1,046 lb. Total depth 5,312 ft.

Fostoria Area Wildcat Completed in Harris

Michel T. Halbouty 1-A Foster Lumber Co., 2 miles south of Fostoria in Harris County, was completed for 3,600 M.c.f. of gas per day from Wilcox perforations at 10,879½-89½ ft. Official potential has been filed.

Second Well Finaled in New Oyster Lake Field

Southern Minerals Corp. completed 1 State of Texas Tract 311 in new Oyster Lake field, Matagorda County. The well made 290,000 M.c.f. of dry gas daily from perforations at 4,008-20 ft.

Location is 2,800 ft. southwest of the 1 H. LeTulle gas discovery, a September discovery that flowed 180,000 M.c.f. per day from the 4,000-ft. sand. The second well in the field failed to find production.

NORTH TEXAS

Wise County Workover Is Atoka Oil Discovery

Christie, Mitchell & Mitchell, Houston, have recompleted their 1 E. H. Smith in north-central Wise County as an Atoka conglomerate oil discovery.

Discovery potential was 111 bbl. of oil a day through 16/64-in. choke, from perforations at 5,745-49 ft. Flowing pressure was 165 psi. Total depth was 6,304 ft. Location is 4 miles southeast of Alvord townsite and 4 miles east of Alvord field.

Central Wise County gas production gained a long north extension in the Boonsville area at Hammon Oil & Refining Co. 1 Rawle Unit. Gas flow was 7,000,000 cu. ft. per day from perforations in the Bend conglomerate at 5,584-6,190 ft. Gas-liquid ratio was 110,000:1. Location is approximately 4 miles northwest of Decatur in Lee C. Smith Survey, A-734.

Conglomerate Is Heavy Producer in Jack County

The Jacksboro area in Jack County gained a flush oil producer at Charles H. Kadane 1 J. E. Jamison, 6 miles north of Jacksboro.

Completion potential was 420 bbl. of 44°-gravity oil a day through 12/64-in. choke, from perforations in the conglomerate at 5,390-5,402 ft. Gas-oil ratio was 600:1, tubing pressure was 350 psi. Operators had drilled to 5,470 ft. and set 5½-in. casing on bottom.

Location is in the J. Gage Survey, A-1746.

The Texas Co. 1 S. F. Borden estate has opened Pennsylvanian conglomerate production in Gilley (Caddo) field, just northeast of Jacksboro townsite.

Potential was 193 bbl. of 38°-gravity oil a day through 24/64-in. choke, from perforations at 5,902-32 ft. and 5,906-36 ft. Gas-oil ratio was 1,115:1. Tubing pressure was 300 psi.

SOUTH TEXAS

Jim Wells Discovery Completed for Oil

Hugo Allen and W. C. McBride, Inc. completed a new oil strike off the north end of the Magnolia city area of Jim Wells County for 127 bbl. of oil per day.

The 1 Nina Adams Estate is on the Los Presenos Grant, 5 miles southeast of Alice. It found production in the Vicksburg sand at 5,406-09 ft. The proposed name for the new area is "Adams (Vicksburg) field."

Ricardo Area Is Once More Producing Oil

Oil production was reopened in the old Ricardo field southeast of Kingsville in Kleberg County. John B. Hawley 2 Allen East got 126 bbl. of oil per day from the Catahoula section at 3,001-06 ft. on 10/64-in. choke.

West Texas Reference Book Published

Petroleum Review, Howard County, Texas, is available from Phifer Petroleum Publications, P. O. Box 20,024, Houston.

The Howard County book is another in a series on oil and gas producing counties in West Texas. Data includes a chronology of field discoveries and production record by fields.

The list of fields includes discovery well and completion data. Production is listed by year, with number of producing wells, and cumulative production to the end of the year. Status of the field is to September 1, 1957.

Illustrations include electrical logs on discovery wells, or of typical field wells; field maps with contours plotted, and a typical geological chart for West Texas. Further information and prices may be had by writing Phifer Petroleum Publications.

Successful Wildcats

ALBERTA

Shell-Canadian Superior 7-12-32-4 East Harmattan, LSD 7, 12-32-4w5 Mississippian discovery. TD 8,600 ft.

SASKATCHEWAN

Tidewater 8-12 Arlington Crown, LSD 8, 12-6-1w2. Charles discovery. TD 3,882 ft.

Imperial 10-35 Roslyn, LSD 10, 35-29-28w3 YViking gas well. TD 2,375 ft.

SOUTH LOUISIANA

Lafayette Parish: Pan American Petroleum Corp. 2 Antoninette L. Couret, 8 9s-5e. IP 168 BOPD, 13/64-in. choke, 29.4°, GOR 209 cu. ft. per barrel, TP 300 psi., perfs. 11,523-30 ft. TD 11,800 ft. (Opens new deep reservoir and extends production on west flank of old Anse La Butte dome.)

CALIFORNIA

Colusa County: Honolulu Oil Corp. 1 Jane F. Carter, NW NE 19-17n-1w, 1,250 M.c.f. daily, 19/64-in. choke, perfs. 2,450-85 ft., TD 3,000 ft. (New gas pool discovery in Compton Landing gas field.)

Ventura County: Max Pray, operator, 1 Max Pray-Donlon, NE NW 14-1n-22w, 740 BOPD., 32.7° gravity, 24/64-in. choke, clean crude, perfs. 7,745-67 ft., TD 9,836 ft. (New pool discovery 1 mile south of Oxnard field production).

WEST CENTRAL TEXAS

Shackelford County: Three Sisters Drilling & Producing Co. 1-B Dyer heirs, Sec. 74, Blk, 12, T&P Sur., 10 miles south Albany. IP 48 BOPD, ⅞-in., 37°-gravity, GOR 250, TP 320 psi., Cook sand 1,111-19 ft. TD 1,202 ft.

Taylor County: Allison & Anderson 1 Blackwood, Sec. 25, Blk. 1, SPRR Sur., 1 mile south Tuscola. Workover well. TD 4,965 ft., PB 4,560 ft., IP 107 BOPD, 41°-gravity, GOR 1350, TP 110 psi., pay 4,452-62 ft.

S. B. Roberts 2 McFall, Sec. 14, LAL Sur., 4 miles southeast Abilene. IP 84 BOPD, ¾-in., 37°-gravity, GOR 500, 250 psi., Cook sand 1,886 ft TD 1,905 ft

Throckmorton County: Norwood Drilling Co 1-171 Swenson Land & Cattle Co., Sec. 171, BBB&C Sur., 8 miles northwest Throckmorton. IPP 113.6 BOPD, 40°-gravity, GOR 100, Strawn 4,030-33 ft. TD 4,038 ft.

SOUTHEAST NEW MEXICO

Lea County: Tennessee Gas Transmission Co. 2 State "B," SW NW 21-16s-34e. IP 240 BOPD, 9/64-in., 40°-gravity, pay 11,180-11,215 ft. TD 11,596 ft.

WEST TEXAS

Crosby County: Smith & Breyer 1 Curtis Wheeler, Sec. 1040, Blk. 1, H&OB Sur., 7 miles northeast Slaton. IPP 36 BOPD, 23°-gravity, Glorieta 4,246-99 ft. TD 4,412 ft.

NORTH TEXAS

Wise County: McCommons Oil Co. 1 M. F. Wood, T. Leftwick Sur., A-500, 1 mile south Chico. IP 790,000 cu. ft. gas, GLR 110,000:1, Strawn perfs. 4,523-28 ft. TD 4,555 ft.

JERRY BUNCE

How to Keep Rigs Running

. . . calls for tight rein on costs. Arrow's new executive vice president greets 1958 with activity at high level.

KNOW ALL YOUR COSTS before drilling, and eliminate all inefficiency. That's G. W. Bunce's idea of how a successful oil-well drilling firm should be run.

"In the highly competitive drilling industry, if the contractor doesn't know what all his costs really are before he starts to drill, he won't be in the business very long."

As the new executive vice president of Arrow Drilling Co. in Tulsa, Bunce has his fingers on the pulse of the company's 22 rotary tables to make sure most of them are turning. Currently 19 of them are.

One has just topped Canada's record by churning down to 15,195 ft. in Alberta's central foothills 55 miles northeast of Jasper.

Another landed at Istanbul last week and will probe to 10,000 or 12,000 ft. in Turkey.

Others are active in Oklahoma, Texas, Mississippi, Louisiana, New Mexico, Wyoming, and British Columbia. Keeping them going, Bunce says, means a careful study of cost angles on everything, including equipment, trucking, depreciation, wages, fuel, water, and locale.

The accountant . . . Bunce has had his eye on cost and efficiency ever since he graduated from high school in his hometown of Topeka, Kans., during the depression days of the early '30's.

It would have cost too much to go to college for 4 years, so he put his efficiency to test by enrolling in a 3-year course at the Kansas School of Accountancy in Topeka.

After a short time as an accountant for the State of Kansas, he and his wife Peggy moved to oil country where Bunce took a job in the accounting department of Noble Drilling Co. in Tulsa in 1936.

Seven years later he joined Arrow Drilling. As chief accountant, assistant secretary, and then treasurer-controller, Bunce has helped keep a tight rein on the company's costs the past 14 years.

Arrow's operations . . . As executive vice president of Arrow, Bunce will have a wider range of responsibilities with the big drilling company. But they will all be within the framework of drilling activity.

Until recently, Arrow was a drilling and producing subsidiary of Canadian British Empire Oil Co., Ltd. But last August, Arrow was sold to Westates Petroleum Co. Oil properties were turned over to a sister company, Hamilton Dome Oil Co., Ltd., and Arrow became strictly a drilling firm.

Last year, Arrow turned to overseas operations by tying in with Keir & Cawder, Ltd., a Scottish construction and engineering firm. The outcome was a new subsidiary called Keir & Cawder Arrow Drilling Co., Ltd.

Personals

Virgil E. Spradlin has resigned as manager of the Mid-Continent office of Mayfair Minerals, Inc., to open offices as a consulting geologist in Wichita.

Philip G. Dolbow, junior engineer trainee with Sohio Petroleum Co., has been transferred to Elmore City, Okla., from Russell, Kans.

H. A. Scott, Jr., petroleum engineer with Ohio Oil Co., has been named supervisor of the company's western Oklahoma and southwestern Kansas division. He will headquarter in Liberal, Kans.

Bill Oliver has resigned as geologist with Lawton-Partee Oil Co. to join Olin Mathieson Chemical Corp. in Monroe, La., as geologist.

A. W. Doshier, district exploration geologist of Gulf Oil Corp.'s West Texas district at Midland, has been promoted to assistant district exploration manager at Roswell, N. M. **John A. Norwood** moves from district production geologist to district exploration geologist at Midland to replace Doshier. **L. L. Fuller** has been transferred to Midland from Roswell to replace Norwood as district production geologist.

Harry J. Russell has resigned as vice president and chief geologist of Gilbraltar Oil Corp. at Midland, Tex., to set up offices as a consulting geologist there.

James D. Divelbiss, Fort Worth geophysical consultant, has been appointed district geophysicist in Tidewater Oil Co.'s Casper, Wyo., district.

Robert M. Shiels, production engineer in Pan American Petroleum Corp.'s Andrews, Tex., district office, has been promoted to production engineer in the reservoir department and transferred to Midland, Tex.

The new company has signed a 2-year contract with N. V. de Bataafsche Petroleum Mij., a Royal Dutch-Shell firm. First assignment is a 10,000 to 12,000-ft. wildcat near Babaeski in the northwest part of European Turkey. The crew is there waiting to rig up rotary.

Seven of Arrow's rigs operate in Canada. The rig that beat Canada's drilling-depth record drilled to a total depth of 15,195 ft. at the British American Oil Co., Ltd., 6-4 Lambert Creek, a wildcat 145 miles west and slightly south of Edmonton.

The hole, which is currently plugging back, is nearly 500 ft. deeper than Canada's previous record holder, the Owen Development Co. 1 Hillsborough, which went to 14,696 ft. off the coast of Prince Edward Island in eastern Canada in 1942.

Family . . . Bunce and his wife have a 17-year-old daughter Barbara, who as a high-school junior has a knack for figures, just like her father.

She's taken all the algebra she can, is rounding out geometry, and is looking ahead to calculus next year. She topped off this heavy load by enrolling in a college trigonometry course.

Taking a great interest in her progress, Bunch wants his daughter to put her math talent to good use by becoming an engineer. "But," he smiles with typical resignation of a teenager's father, "she hasn't made up her mind yet. Every month she wants to be something different. Right now she wants to be a psychologist."

Bunce finds relaxation by going to his 80-acre farm near Tulsa. He plans to buy more farm acreage and grow wheat and oats, and raise cattle. With his bent for efficiency and cost-cutting, chances are good for bumper crops.

Frank Ramsey has been named manager of Texas Gas Transmission Corp.'s Wilmot, Ark., compressor station. Ramsey transfers from Lake Cormorant, Miss., where he has been assistant manager. At Wilmot he succeeds **George F. Mosby,** who has retired.

E. J. Mulvihill, manager of Venezuelan Petroleum Co., **B. N. Moore,** director of exploration and chief geologist, and **J. J. Quoyeser,** assistant manager, have been elected vice presidents of the company, a subsidiary of Sinclair Oil Corp. All were officers of Sinclair Oil & Refining Co., Venezuelan Petroleum subsidiary, whose operations were taken over by Venezuelan Petroleum last month.

Myles A. Colligan has resigned as chief geologist at Midland, Tex., for Wilshire Oil Co. of Texas to open a geological consulting office in Midland.

Paul N. Weidner, chief petro'eum engineer for Creole Petroleum Corp., has been named assistant head of the production department in Caracas. He succeeds **B. (Joe) Stagg,** who has retired. **James F. Dean** will replace Weidner as chief petroleum engineer. **Edward R. Bower** has been named new assistant head of petroleum engineers.

Ralph M. Willits has been promoted to mechanical engineer at General Petroleum Corp.'s Torrance, Calif., refinery. A graduate of California Institute of Technology, Willits joined GP in 1946 as a job engineer. **Jack D. Swafford** has been named head of General Petroleum's new Alaska land office in Anchorage. He transfers from Salt Lake City.

Robert J. Askevold and **Dr. Donald C. Bond** have been named assistant research directors for Pure Oil Co. **Dr. Milton M. Marisic** has been appointed assistant manager of the company's Crystal Lake, Ill., research center. Askevold will be in charge of refining and marketing research; Bond, in charge of production and transportation research.

Fred A. Hilton has transferred from Saudi Arabia to New York to become assistant to the manager of Arabian American Oil Co.'s producing and pipeline department. **Fred R. Waldron,** of the department's exploration section, and **Howard P. Ross,** engineering department, also have transferred to New York from the field. **John W. Shute,** geologist, has rejoined Arabian American Oil Co. in New York after a 3-year stint with Creole Petroleum Corp. in Venezuela. He started in the oil business with Aramco.

William A. Keeler, regional engineer in Atlantic Refining Co.'s West Texas-New Mexico region engineering and construction department, has been named field group supervisor of the department's southwest section. **Donald B. Helm** will succeed Keeler. Helm currently is district engineer in the department at Corpus Christi, Tex. **J. C. Osborne,** mechanical engineer in the design group at Dallas, has replaced Helm at Corpus Christi. **Donald S. Pile,** field engineer at Midland, Tex., has been named district engineer at Odessa, Tex., and alternate to the regional engineer.

Personals

DOUGHERTY

William E. Dougherty, assistant chief geologist for Humble Oil & Refining Co. since 1956, has moved up to chief geologist. He succeeds **Edward A. Wendlandt,** who has retired after 33 years with Humble. Dougherty joined the company in 1936. He was division geologist in Corpus Christi, Tex., area and later at Midland, Tex., before appointment as assistant chief geologist in Houston. Wendlandt, who joined Humble in 1924, was head of the East Texas division before being named chief geologist in 1955. His retirement becomes effective January 30.

Bill McMullen, Continental Oil Co. geologist, has been transferred to Casper, Wyo., from Denver.

Forrest A. Garb, formerly with Socony Mobil Oil Co., Inc., has joined H. J. Gruy & Associates, Dallas consulting firm.

C. A. P. Leahey, special representative of the Bank of Montreal in Calgary, has been named manager of the bank's oil and gas department there.

Ralph W. Myerholtz, Jr., has been named a group leader in the chemicals research division of Standard Oil Co. (Ind.) at Whiting, Ind. Myerholtz has been with Indiana Standard since 1954. He is a graduate of Northwestern University.

B. B. Turner, president of Ethyl Corp., has been named chief executive officer of the company. **Edward L. Shea,** formerly chief executive officer, will continue as chairman of the board. Turner was named president of Ethyl in 1956. He was executive vice president before that time. Shea became president of the company in 1947 and chairman in 1956.

Dan T. McDonald has been appointed executive vice president of Goliad Oil & Gas Co. in Calgary. The company is currently constructing and will operate facilities for gathering and processing gas produced in Pembina field. McDonald was formerly vice president of Murmanill Corp. of Dallas and several of its subsidiaries.

West Central Texas AIME Elects

A. J. Evans, second from left, Warren Petroleum Corp., Abilene, has been named president of the West Central Texas section of Society of Petroleum Engineers of AIME. Other officers are, left to right, Lee Webster, Katz Oil Co., secretary-treasurer; Evans; E. L. Anders, Jr., consultant, first vice chairman; P. M. Bridges, Russell Engineering, second vice chairman; and H. C. Wilson, Geochemical Surveys, and Norman D. FitzGerald, independent, directors. All are from Abilene.

Marshall W. Bailey has resigned as a geologist for Tennessee Gas Transmission Co. at Midland, Tex., to join Conkling & Irwin, Ltd., at Abilene, Tex.

Carl B. Edington, formerly with the Reddin Operators Committee in Abilene, Tex., has been named manager of operations in Tannehill Petroleum Co.'s new Abilene office. Tannehill is operating a water flood in Shackelford County, Texas.

Chris H. Pedersen, gas superintendent at Stockton, Calif., for Pacific Gas & Electric Co., has been promoted to gas superintendent of the company's East Bay division, Oakland, Calif. He succeeds **Thomas P. Jenkins,** recently appointed manager of the Humboldt division at Eureka, Calif. **John Bianucci,** East Bay division gas engineer, transfers to Stockton to succeed Pedersen as gas superintendent there. **John G. Smith,** distribution engineer in San Francisco, transfers to Oakland to succeed Bianucci.

Joseph A. Dunphy has been appointed technical foreman in the dispatching area of Tidewater Oil Co.'s Delaware City, Del., refinery. **Robert E. O'Sullivan** and **James D. Moneymaker** have been named staff engineers at the Delaware refinery. O'Sullivan is in the alkylation-polymerization area; Moneymaker, in the utilities and sulfur recovery area. In other appointments at Delaware City, **Donald M. Warren** becomes staff assistant to the refinery superintendent, and **Paul L. Work** has been named acting group leader in spectroscopy.

Denton E. Fox, Jr., has been named petroleum engineer for American Overseas Petroleum, Ltd., in New York. Fox has been on 2-year loan to Standard Oil Co. of California in Taft, Calif.

J. B. Storey, manager of the New Orleans district of United Gas Pipe Line Co. and its producing subsidiary, Union Producing Co., has been elected a director of Union Producing. He will headquarter in Shreveport. **R. G. Bryan,** assistant manager of the New Orleans district, moves up to manager succeeding Storey. Storey has been with the company since 1935 and had held his position in New Orleans since 1950. Bryan joined United Gas in 1941.

Clarence Edmond Smith, formerly staff engineer in Denver with British-American Oil Producing Co., has joined Anderson-Prichard Oil Corp. as reservoir engineer in Oklahoma City.

S. C. Stoneham has been appointed staff seismologist for Standard Oil Co. of California, Western Operations, Inc. He will headquarter in Oildale, Calif. Stoneham will have charge of developing new interpretation techniques and reviewing existing seismic interpretation methods.

Bill A. Strauss, director of the certificate department, Northern Natural Gas Co., has been named administrative vice president, a newly created position. A graduate of Iowa State in general engineering, Strauss joined Northern's engineering department in 1948. He will assist the president in coordinating operations.

C. N. Beyrle, Jr., formerly drilling foreman at Red Wash, Utah, for Standard Oil Co. of California, has been transferred to Alaska as drilling representative there.

Don McCann has been named operations superintendent at the Casper, Wyo., refinery of Socony Mobil Oil Co., Inc. He succeeds **C. A. Goodnight,** who has retired after 34 years with the company. **R. S. Couture** has been appointed labor and transportation foreman at the Casper refinery. He succeeds **C. D. Ebersold,** also retired.

John Fisher has been named representative on outside operated properties for Kerr-McGee Oil Industries, Inc. He will continue to negotiate gas sales and purchase agreements and coordinate activities with the Federal Power Commission. Kermac has named **Harry Hanna,** recently transferred to Oklahoma City from Morgan City, La., chief engineer in the production department. **George Girouard** has been named reservoir engineer.

William R. Remalia, American Oil Co.'s manager of products supply, has been appointed general supply manager. He succeeds **I. W. Fariss,** who has resigned. **Edward G. Spottswood,** assistant manager of products supply, moves up to succeed Remalia as manager. Remalia joined Standard Oil Co. (Ind.) in 1938 as a chemical engineer. He was manager of economics for Pan-Am Southern Corp., an affiliate, before transferring to American Oil in 1956. Spottswood joined the company in 1943.

Personals

Earl M. Kipp, director, vice president and assistant to the president of The California Co., has been transferred to Standard Oil Co. of California, the parent company, as special consultant, producing problems, on the staff of the vice president in charge of production. He will transfer to San Francisco from New Orleans. **James E. Gosline,** special producing consultant for Socal in San Francisco, will succeed Kipp with The California Co. in New Orleans. Kipp joined Socal in 1936. He was named chief engineer of Calco in 1946, and vice president in 1956. Gosline has been with the company since 1933. He was general manager of the producing department before becoming special producing consultant last year.

E. M. KIPP

J. E. GOSLINE

John D. Cranor, Jr., production foreman with Pan American Petroleum Corp., has been transferred to Oklahoma City from Brownsville, Tex.

George H. Hirschfeld has resigned as engineer with the New Mexico Oil and Engineering Committee to join Moran Oil Producing & Drilling Corp. in Hobbs, N. M.

George Grenyo has been appointed manager of the Wichita office of Oil Trading Associates. He succeeds **John C. Benedict,** who recently resigned to form Benedict Oil Associates in Wichita. Grenyo transfers to Wichita from the company's Texas City office.

Carl C. Whitaker, construction supervisor for Trans-Canada Pipe Lines, Ltd., has been appointed superintendent of operations for the company. He will headquarter in Toronto. Whitaker will be responsible for the company's field, construction operations, dispatching, gas measurement, and cathodic-protection sections. He was with Lone Star Gas Co., Tennessee Gas Transmission Co., Transcontinental Gas Pipe Line Corp. and in private business before joining Trans-Canada in 1956.

Tom Cameron, formerly with Tidewater Oil Co., has joined Bradford Bishop, Inc., in Bakersfield, Calif., as a geologist.

Henderson Supplee, Jr., president of Atlantic Refining Co., has been elected a director of the National Industrial Conference Board.

J. G. Courtney has returned from military leave of absence to join Magnolia Petroleum Co. as junior drilling engineer in Lake Charles, La.

R. Wayne Goodale, manager of the lubricant division of Standard Oil Co. of California, has been elected vice president, fuels and lubricants, for Society of Automotive Engineers.

Bill Alcorn, district attorney at Brownwood, Tex., since 1950, has been appointed commissioner of Texas' general land office effective February 1 by Gov. Price Daniel. Alcorn will replace **Earl Rudder,** who is resigning to become a vice president of Texas A. & M. College.

Norman C. Smith, photogeological consultant, has been elected 1958 president of the Dallas Geological Society. **Dan E. Feray,** consultant, and **Peter N. Wiggins III,** Wiggins Brothers, Inc., are new vice presidents. **Paul W. Foster,** Atlantic Refining Co., is secretary, and **Phil Porter,** DeGolyer & MacNaughton, is treasurer.

J. S. Cogan has been named vice president of Imperial Oil, Ltd. Cogan has been responsible for Imperial's long-term planning of manufacuring operations. He came to Imperial in 1954 from Standard Oil Co. (N. J.), where he was manager of the coordination and petroleum economics department. Cogan is a graduate of Colorado College and Massachusetts Institute of Technology.

Robert E. Thompson, process engineer for El Paso Natural Gas Products Co. in Odessa, Tex., has been promoted to plant engineer and transferred to Gallup, N. M.

Lloyd B. Robertson, Worland, Wyo., district geologist for Mobil Producing Co., has been transferred to Mobil Overseas Oil Co., Inc., in Nigeria. He will be exploration representative. **Gerald C. Cooper,** formerly in Billings, Mont., has been transferred to Worland to succeed Robertson.

J. Paul Roston, consultant and former head of the petroleum section, mining engineering department, at Missouri School of Mines, has joined Alex W. McCoy Associates, Inc., Tulsa, as staff engineer.

DEATHS

Robert Bruce Cram, 52, assistant treasurer of Trunkline Gas Co., died January 2 in Houston.

Thomas Michael Moroney, 77, retired superintendent for Oklahoma Pipe Line Co., died recently in Tulsa. Moroney entered pipelining in 1900 with Eureka Pipe Line Co. He was later with Buckeye Pipe Line Co. and Prairie Pipe Line Co.

Charles C. Cady, 95, long-time independent operator in Moran, Tex., died December 31 at his home in Pasadena, Calif. Cady went to Moran with the oil boom in 1923 and lived there until moving to Pasadena a few years ago.

Dan C. Rhodes, 51, Houston, assistant division superintendent for Humble Oil & Refining Co., died January 4 in Houston. He had been in poor health for the past 2 years. Rhodes had been with Humble 29 years.

C. L. Clausel, Sr., 62, Houston independent operator and former president of A-1 Bit & Tool Co., died December 31 in Houston. Clausel retired from A-1 Bit & Tool 4 years ago. He had been associated with Housh Drilling Co. and Marine Transport Co. since that time.

Bernard F. Alfs, 79, founder and president of the old Crescent Refining & Oil Co., died January 5 in Los Angeles after a heart attack. A pioneer West Coast oil man, Alfs was with Tidewater Oil Co. in San Francisco before moving to Los Angeles in 1910.

Cary Harrison, 89, special representative for Hughes Tool Co. in Houston, died January 6 in Houston after a heart attack. Harrison was a driller in many of the early Gulf Coast fields, including Spindletop and Goose Creek, before joining Hughes Tool in 1920.

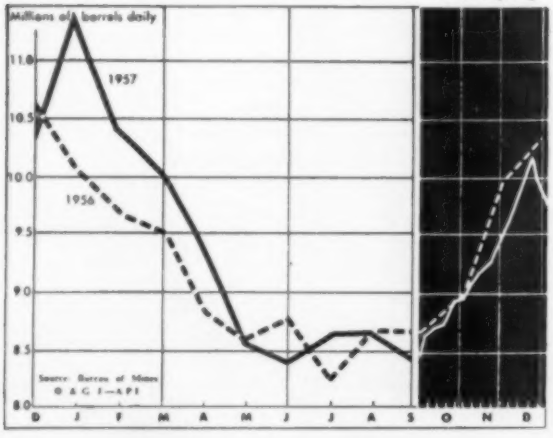
Latest Figures . . . Industry Trends

A QUICK LOOK AT THE HIGHLIGHTS

	LATEST WEEK	Change from WEEK AGO		Change from YEAR AGO	
Production	6,859,425	DOWN	72,245	DOWN	606,414
Crude stocks	276,233,000	DOWN	1,489,000	UP	11,992,000
Completions	*510		(*)		(*)
Refinery runs	7,867,000	DOWN	9,000	DOWN	423,000
Gasoline stocks	198,035,000	UP	3,870,000	UP	10,868,000
Kerosine stocks	28,511,000	DOWN	243,000	DOWN	2,683,000
Distillate stocks	150,021,000	DOWN	1,748,000	UP	17,079,000
Residual stocks	59,621,000	UP	715,000	UP	16,890,000
Four-product stocks	436,188,000	UP	2,594,000	UP	42,154,000
Total imports	1,657,900	DOWN	49,600	UP	142,800

*Incomplete week.

TOTAL DEMAND—ALL OILS



Refinery Runs and Product Yields Will Set Product Prices in 1958

THE PETROLEUM-PRODUCTS MARKET has reached a fork in the road. It will be up to refiners to decide which way they want to go. Their decisions on runs and yields over the next 3 months will be the primary factors in the determination of product prices for 1958.

The petroleum market is sick, but it's just a case of indigestion. The patient can be cured if his diet is changed to give him the proper selection and correct volumes of products. A continuously revised supply-and-demand table should be the refiner's diet chart.

The patient is the domestic market for petroleum products. His digestive system is consumer demand, and petroleum demand is relatively inelastic. You can't get much of an increase by trying to coax the digestive system with bribes in the form of price cuts even if the cuts drop prices below actual costs.

The principal food on the diet chart for the patient is gasoline. Consumption is not influenced very much by price. The patient also is very allergic to oversupply. At the present, he has a definite rash and an asthmatic wheeze. He won't die, but he will be very uncomfortable until the supply is brought more in line with demand.

Differences between supply and demand show up as stock changes. For gasoline, there is a normal gain in stocks during the winter months and a reduction in the summer. Too often, the adequacy of the stock volume is measured only by a comparison with the previous year.

Stocks have to increase when demand moves up, but not necessarily in the same ratio. Since the end of World War II, an annual gain of 8,000,000 bbl. in gasoline stocks would not have been out of line. On this basis alone, current gasoline stocks would not be too high since they are up only about 8,000,000 bbl. from last year. The important factor in the diagnosis and treatment is the fact that last year's gasoline stocks were too high.

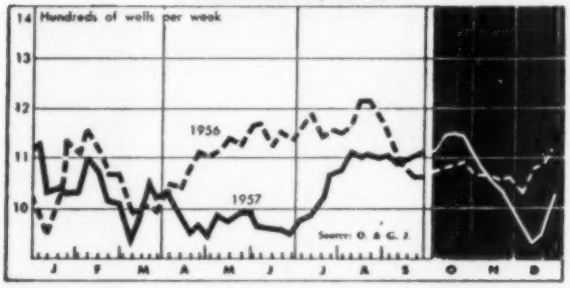
Total gasoline stocks were 21,800,000 bbl. higher at the end of 1956 than at the close of 1955. Also, 1955 stocks were up 10,000,000 bbl. from 1954. The patient could have used a reduction of 8,000,000 bbl. in gasoline stocks for 1957 rather than a gain of that amount.

The result: Gasoline prices are low. The Group 3 market is stronger than some others, but even here spot regular gasoline is selling for only 0.75 cent more than in January 1948, despite all of the improvement in quality. Regular gasoline on the Gulf Coast can be bought for at least 0.5 cent less than in 1948.

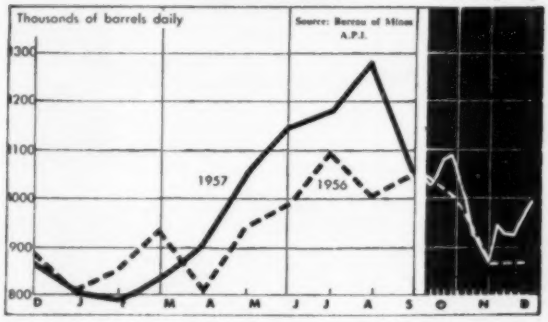
The prescribed treatment: Base refinery runs on a forecast of total demand for all oils, and gasoline yields on a realistic estimate of gasoline demand after deducting surplus product in storage.

Socony Mobil Oil Co. announced price increases of 0.2 to 0.3 cent a gallon on light fuels, effective January 7.

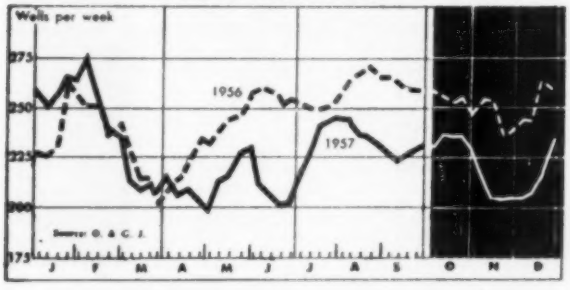
TOTAL COMPLETIONS



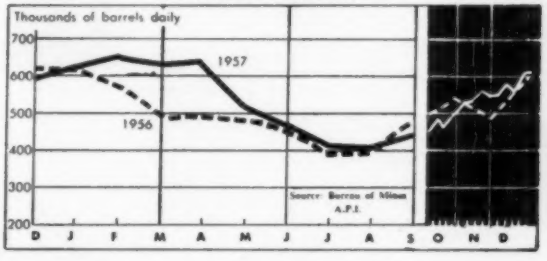
CRUDE IMPORTS



WILDCAT COMPLETIONS



PRODUCT IMPORTS

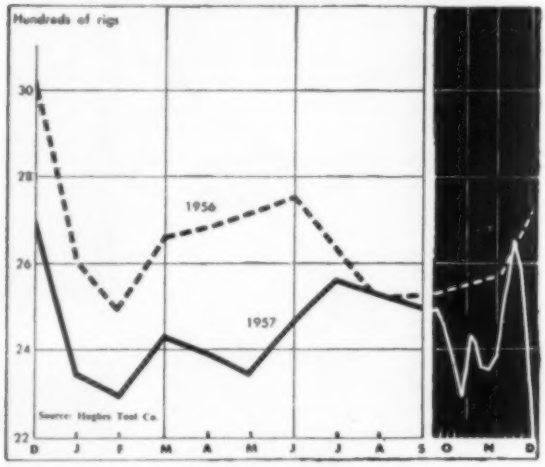


WEEKLY WELL COMPLETIONS . . . WEEK ENDED JANUARY 4, 1958

	Total wells							Cumulative		Total wildcats					Cumulative	
	Total	Crude	Cond.	Gas	Dry	Service	Footage	1958	1957	Total	Crude	Cond.	Gas	Dry	1958	1957
Alabama	2	1	0	0	1	0	19,420	2	0	1	0	0	0	1	1	0
Arkansas	13	10	0	0	3	0	37,839	13	13	2	0	0	0	2	2	1
California	71	49	0	2	20	0	363,644	40	47	13	1	0	1	11	7	10
Colorado	18	3	0	0	15	0	98,188	11	51	9	1	0	0	8	5	31
Illinois	24	7	0	1	16	0	58,101	13	0	4	0	0	0	4	4	0
Indiana	11	7	0	0	4	0	19,228	11	22	4	1	0	0	3	4	7
Kansas	99	50	1	4	43	1	362,060	57	86	20	0	0	0	20	11	18
Kentucky	8	3	0	0	5	0	8,226	8	35	1	0	0	0	1	1	7
Louisiana	16	10	0	1	5	0	61,122	16	73	7	0	0	0	7	7	10
North	16	10	0	1	5	0	61,122	16	51	7	0	0	0	7	7	6
South	(†)	....	....	....	....	....	.....	.....	18	....	....	....	....	....	.....	4
Offshore	(†)	....	....	....	....	....	.....	.....	4	....	....	....	....	....	.....	0
Michigan	3	0	0	0	3	0	8,107	3	10	1	0	0	0	1	1	3
Mississippi	8	2	0	0	6	0	63,984	8	6	3	0	0	0	3	3	1
Montana	19	7	0	1	11	0	83,198	19	7	8	0	0	1	7	8	1
Nebraska	20	3	0	0	17	0	114,343	13	18	15	1	0	0	14	8	15
New Mexico	(†)	....	....	....	....	....	.....	.....	21	....	....	....	....	....	.....	2
Northwest	....	....	....	....	....	....	.....	.....	21	....	....	....	....	....	.....	2
Southeast	....	....	....	....	....	....	.....	.....	0	....	....	....	....	....	.....	0
New York	10	5	0	0	0	5	13,500	10	.....	0	0	0	0	0	0	.....
North Dakota	11	2	0	0	9	0	51,697	11	6	7	0	0	0	7	7	2
Ohio	10	4	0	0	5	1	23,558	10	24	0	0	0	0	0	0	0
Oklahoma	119	62	4	3	46	4	399,609	70	145	25	2	1	1	21	14	21
Pennsylvania	0	0	0	0	0	0	0	0	*10	0	0	0	0	0	0	*2
Texas	(†)	....	....	....	....	....	.....	.....	423	....	....	....	....	....	.....	120
District 1	....	....	....	....	....	....	.....	.....	30	....	....	....	....	....	.....	11
District 2	....	....	....	....	....	....	.....	.....	3	....	....	....	....	....	.....	0
District 3	....	....	....	....	....	....	.....	.....	34	....	....	....	....	....	.....	10
District 4	....	....	....	....	....	....	.....	.....	27	....	....	....	....	....	.....	14
East	....	....	....	....	....	....	.....	.....	22	....	....	....	....	....	.....	5
District 7-B	....	....	....	....	....	....	.....	.....	40	....	....	....	....	....	.....	19
West	....	....	....	....	....	....	.....	.....	139	....	....	....	....	....	.....	16
District 9	....	....	....	....	....	....	.....	.....	92	....	....	....	....	....	.....	38
District 10	....	....	....	....	....	....	.....	.....	36	....	....	....	....	....	.....	7
Utah	4	3	0	0	1	0	23,838	4	7	1	0	0	0	1	1	6
West Virginia	19	5	0	7	7	0	54,641	9	17	0	0	0	0	0	0	2
Wyoming	24	7	0	3	14	0	104,574	16	25	9	0	0	1	8	4	9
Miscellaneous (Wash.)	1	0	0	0	1	0	8,400	1	1	1	0	0	0	1	1	2
Total U. S.	510	240	5	22	232	11	1,977,277	345	1,047	131	6	1	4	120	89	270
Total prev. week	1,172	537	24	79	512	20	4,845,011	.....	.....	264	23	4	10	227	.....	.....
Cumulative 1958	345	139	2	12	186	6	1,129,900	.....	.....	89	3	0	2	84	.....	.....
Western Canada	71	41	0	5	25	0	319,782	40	0	21	1	0	0	20	11	0

*Including New York. †Texas, South Louisiana, New Mexico figures unavailable for week.

ROTARY RIGS OPERATING IN UNITED STATES

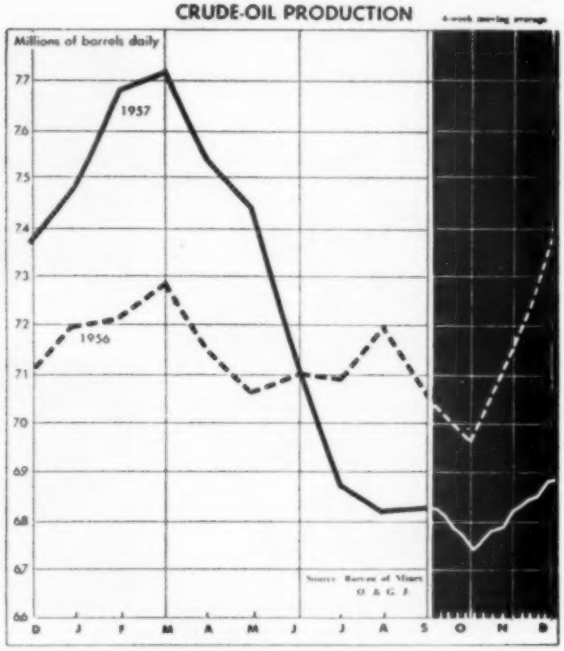


ACTIVE ROTARY RIGS*

Area—	1-6-58	12-30-57	12-23-57	1-7-57
Alabama	8	8	9	8
Arkansas	18	16	23	21
Arizona	...	1	1	...
California	91	94	99	107
Colorado	33	35	39	42
Florida	1	1	1	2
Georgia	....	....	....	....
Idaho	...	...	...	1
Illinois	44	30	49	47
Indiana	3	4	10	6
Iowa	2	2	2	1
Kansas	118	138	165	157
Kentucky	8	6	8	10
Louisiana	374	377	392	438
North	35	39	47	42
South	261	260	262	294
Offshore	78	78	83	102
Maryland	1	1	1	1
Michigan	7	7	11	11
Missouri	...	...	...	...
Montana	29	31	29	22
Mississippi	54	47	46	24
Nebraska	21	30	35	25
Nevada	....	....	....	2
New Mexico	129	142	164	119
New York	1	1	1	...
North Dakota	43	47	51	28
Ohio	1	1	1	...
Oklahoma	220	227	248	253
Oregon	....	....	....	....
Pennsylvania	7	8	8	10
South Dakota	1	1	1	2
Texas	865	952	1,066	974
Gulf Coast	191	215	244	237
Offshore	3	2	4	6
West	335	352	373	352
North	285	324	369	314
East	51	59	76	65
Tennessee	....	....	....	....
Utah	50	48	52	30
Washington	1	1	1	1
West Virginia	2	2	2	2
Wyoming	50	67	66	51
Virginia	....	....	....	....
Total United States	2,182	2,325	2,581	2,395
Western Canada	189	192	189	222
Eastern Canada	2	1	2	....
Grand total	2,373	2,518	2,772	2,617

*Hughes Tool Co.

CRUDE-OIL PRODUCTION

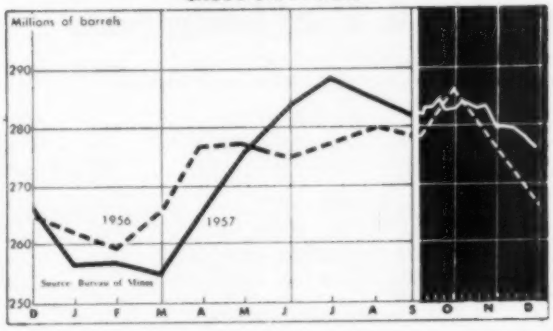


DAILY AVERAGE PRODUCTION FOR WEEK

	January 4, 1958			Dec. 28
	Crude oil	Lease condensate	Total	total
Alabama	15,475	.....	15,475	15,550
Arkansas	82,825	200	83,025	82,550
California	928,600	.....	928,600	929,500
Colorado	143,150	.....	143,150	146,000
Eastern	51,800	.....	51,800	51,500
Florida	1,250	.....	1,250	1,275
Illinois	238,000	.....	238,000	242,400
Indiana	31,400	.....	31,400	31,600
Kansas	†320,400	.....	†320,400	†352,340
Kentucky	41,500	.....	41,500	42,700
Louisiana	754,800	90,000	844,800	834,470
North	111,925	2,500	114,425	114,470
South	642,875	87,500	730,375	720,000
Michigan	25,200	.....	25,200	28,300
Mississippi	100,125	4,325	104,450	103,875
Montana	74,600	.....	74,600	74,950
Nebraska	55,300	.....	55,300	55,500
Nevada	150	.....	150	150
New Mexico	259,150	5,700	264,850	263,390
North Dakota	34,500	.....	34,500	33,600
Oklahoma	†562,200	.....	†562,200	609,360
Texas	2,660,375	60,100	2,720,475	2,715,400
Dist. 1	48,275	550	48,825	50,550
Dist. 2	120,150	9,400	129,550	130,300
Dist. 3	379,275	29,000	408,275	406,000
Dist. 4	197,000	6,400	203,400	203,400
Dist. 5	31,425	550	31,975	31,450
Dist. 6	112,425	7,000	119,425	115,400
East Texas Field	160,425	.....	160,425	160,000
Dist. 7-B	144,850	150	145,000	144,125
Dist. 7-C	149,275	4,075	153,350	155,075
Dist. 8	1,011,275	1,650	1,012,925	1,008,800
Dist. 9	202,575	725	203,300	260,700
Dist. 10	103,425	600	104,025	103,600
Utah	14,700	.....	14,700	15,660
Wyoming	303,400	.....	303,400	301,400
Others	‡200	.....	‡200	‡200
Total U. S.	6,699,100	160,325	**6,859,425**	6,931,670
Change from prev. week, down			**72,245**	.....
Canada	†390,500	.....	†390,500	†421,000
Total U. S. prod.—Jan. 1-Jan. 4				27,437,700 bbl.
Same period last year (crude plus cond.)				29,863,356 bbl.

†Includes 588,320 bbl. condensate. ‡Week ended previous Monday.

CRUDE-OIL STOCKS



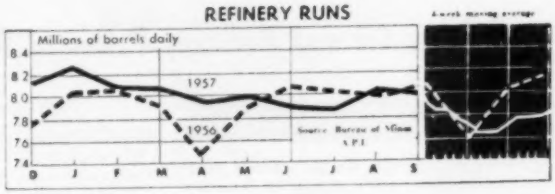
CRUDE-OIL STOCKS BY STATES OF ORIGIN*

(Thousands of barrels)

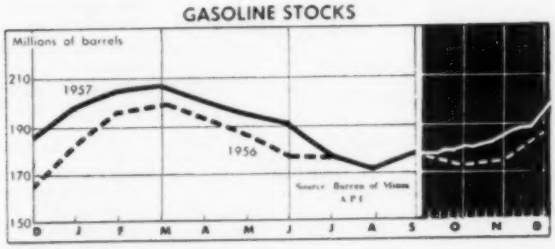
	12-28-57	12-21-57	12-29-56
Pennsylvania Grade	3,039	3,085	2,397
Other Appalachian	1,715	1,704	2,239
Illinois, Indiana, and Michigan	11,481	11,292	10,833
Nebraska and North Dakota	2,437	2,796	2,095
Kansas	9,757	10,578	10,047
Oklahoma	19,756	19,921	23,433
Arkansas	2,766	2,879	2,880
Louisiana	19,448	19,389	19,001
North	2,801	2,906	4,402
South	16,647	16,483	14,599
Mississippi, Ala., and Fla.	2,545	2,811	2,620
New Mexico	9,502	9,545	7,901
Texas	122,418	123,768	117,425
East Texas	8,940	8,877	9,057
West Texas	55,255	56,387	54,224
Texas Gulf	24,792	24,440	22,576
Other Texas	33,431	34,064	31,568
Wyoming	13,641	12,751	16,637
Other Rocky Mountain	6,812	7,106	6,395
California	34,986	34,334	28,170
Foreign	†15,930	15,763	12,168
Total	276,233	277,722	264,241

*Bureau of Mines. †Includes 5,619,000 bbl. in California.

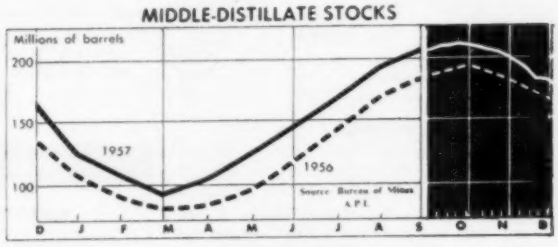
REFINERY RUNS



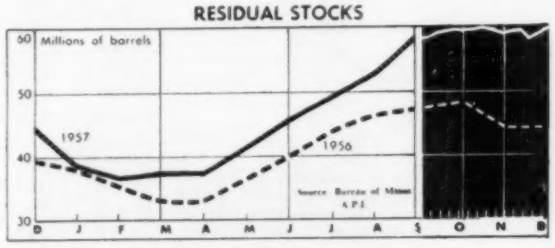
GASOLINE STOCKS



MIDDLE-DISTILLATE STOCKS



RESIDUAL STOCKS



A.P.I. REFINERY REPORT, JANUARY 3, 1958

(Thousands of barrels)

District—	Daily avg. runs	Daily average production—Gaso.*	Kero.	Dist.	Resid.	Stocks‡—Gaso.†	Kero.	Dist.	Resid.	Bureau of Mines, January 1957—Daily avg. runs	Daily average production—Gaso.*	Kero.	Dist.	Resid.
East Coast	1,195	531.8	47.2	343.0	209.3	45,051	12,969	59,410	12,820	1,214	505.7	39.9	370.5	244.6
Appalachian														
District 1	107	42.4	5.4	21.3	9.7	4,948	616	3,147	720	103	40.6	6.3	24.0	9.5
District 2	107	52.9	7.1	21.9	12.0	2,901	506	1,268	471	111	53.3	6.9	20.7	16.7
Ind., Ill., Ky.	1,439	745.6	82.4	344.7	207.6	33,804	6,086	20,206	5,811	1,463	740.7	70.4	345.0	220.4
Minn., Wis., Dak	102	48.3	8.6	21.7	12.7	7,203	1,128	7,227	407	100	47.9	5.6	25.7	12.5
Okla., Kans., Mo.	753	430.3	10.3	215.7	44.4	17,216	1,060	11,796	1,323	714	395.7	16.6	184.8	41.5
Inland Texas	264	206.7	7.7	43.8	23.7	7,548	445	2,030	2,070	279	198.0	7.3	52.0	27.0
Texas Gulf Coast	1,847	892.6	125.7	529.6	186.4	26,782	2,569	16,951	6,014	2,033	914.6	135.1	595.8	257.6
La. Gulf Coast	591	327.0	64.0	98.7	40.3	11,972	1,693	7,413	1,591	704	346.5	62.1	218.6	61.1
N. La. and Ark.	95	37.3	8.9	21.7	7.2	5,095	761	1,888	227	101	41.1	9.4	24.7	8.9
Rocky Mountain:														
New Mexico	27	13.3	0.9	6.3	3.4	469	12	122	95	28	13.9	0.3	5.3	3.6
Other Rocky Mt.	260	127.1	1.7	63.4	36.3	6,459	335	2,882	958	286	137.2	2.4	66.6	41.0
West Coast	1,080	486.3	0.0	159.6	334.4	28,587	331	15,681	27,114	1,138	504.0	4.9	184.4	377.9
Jan. 3, 1958	7,867	3,941.6	369.9	1,891.4	1,127.4	198,035	28,511	150,021	59,621	8,274	3,939.2	367.2	2,118.1	1,322.3
Dec. 27, 1957	7,876	3,989.4	358.4	1,886.7	1,145.6	194,165	28,754	151,769	58,906	.....	.....	.....	.....	.....
Jan. 4, 1957	8,290	4,029.9	414.1	2,066.9	1,249.3	187,167	31,194	132,942	42,731	.....	.....	.....	.....	.....

*At refineries including natural blended. †Finished and unfinished. ‡At refineries, bulk terminals, in transit, and in pipelines.

Crude-Oil and Refinery Prices at Representative U. S. and Foreign Points

REFINED-PRODUCT PRICES

Following quotations are for refinery products in cents per gallon moving in interstate shipments on Wednesday each week unless otherwise noted. Crude-oil prices are per barrel at the wells unless otherwise listed.

GASOLINE*

Mid-Continent (Group 3):	
Regular (89 octane)	11.25-11.75
Premium (98 octane)	14.00-14.50
Gulf Coast (cargoes for coastwise or export movements):	
Regular (90 octane)	10.50-11.00
Regular (92 octane)	10.75-11.25
Premium (97 octane)	12.25-12.75
Premium (98 octane)	12.50-13.00
California (rack) (Los Angeles):	
Regular (88 octane)	12.2
Premium (96 octane)	14.8
Premium (98 octane)	15.0
Caribbean area (cargoes):	
Regular (87 octane)	10.375
Premium (93 octane)	11.25

*Quotations are for octanes shown. Prices usually vary with octane ratings within the regular, premium, and aviation grades.

NATURAL GASOLINE*

Group 3:	
Grade 26-70	4.5
Breckenridge:	
Grade 26-70	4.0

*If 26-70 natural is considered as 100 per cent, prices for lower-vapor-pressure grades increase 2.5 per cent for each unit drop in Reid vapor pressure down to and including 16 lb. Prices for grades below 16 lb. may vary slightly by areas or plants.

KEROSINE AND DISTILLATE

Mid-Continent (Group 3):	
Kerosine 42-44	9.875-10.25
Diesel oil (58 d.i. and above)	9.50-10.00
Distillate No. 1	9.50-10.00
Distillate No. 2	8.875-9.25
Gulf Coast (cargoes):	
Kerosine 41-43	8.75-9.50
Distillate No. 2	8.75-9.50
New York Harbor (barges):	
★ Kerosine 41-43	10.75-10.95
★ Distillate No. 2	10.25-10.55
★ Diesel fuel, 48-52 d.i.	10.55-10.85
Caribbean area (cargoes):	
Distillate No. 2	9.00

WAX (LB.)

Oklahoma (Group 3):	
132-135 A.m.p. (semi-refined) in tank cars	6.50
New York (export):	
126-130 A.m.p. crude-scale (solid in bags or barrels)	7.35

★Denotes change from previous week.

RESIDUAL FUEL (BBL.)

Mid-Continent (Group 3):	
Residual fuel (max. 1% S)	$1.50-1.60
Gulf Coast (cargoes):	
Bunker C fuel	$2.50-2.75
New York Harbor (barges):	
Bunker C fuel	$2.95
Caribbean (cargoes):	
Bunker C	$2.55
California (rack):	
Bunker C fuel, Los Angeles	$2.85-3.00

LUBRICATING OILS

Mid-Continent (Group 3):	
150-160 bright stock, solvent refined, 0-10 p.p., 95 v.i.	25.5
200 vis. neutral oil, solvent refined, 0-10 p.p., 95 v.i.	22.25
Pennsylvania Grade:	
145-155 vis. at 210, bright stock, 8 color, 25 p.t.	27
200 vis. neutral (180° at 100°), 25 p.t.	25

CRUDE-OIL PRICES

GRAVITY SCHEDULE

	Signal Hill, Calif.	Mid-Cont.*	Gulf Coast Tex.†	West Tex.‡ N.M.	Wyo. (sour) ($)
14-14.9	$2.67	....	....	....	....
15-15.9	2.71	....	....	....	$1.81
16-16.9	2.74	....	....	....	1.86
17-17.9	2.78	....	....	....	1.91
18-18.9	2.82	....	....	....	1.96
19-19.9	2.85	....	....	....	2.01
20-20.9	2.89	$2.75	....	$2.62	2.06
21-21.9	2.93	2.77	....	2.64	2.11
22-22.9	2.97	2.79	....	2.66	2.16
23-23.9	3.01	2.81	$3.44	2.68	2.21
24-24.9	3.05	2.83	3.46	2.70	2.26
25-25.9	3.09	2.85	3.48	2.72	2.31
26-26.9	3.13	2.87	3.50	2.74	2.36
27-27.9	3.17	2.89	3.52	2.76	2.49
28-28.9	3.22	2.91	3.54	2.78	2.54
29-29.9	3.27	2.93	3.56	2.80	2.59
30-30.9	3.32	2.95	....	2.82	2.63
31-31.9	3.38	2.97	....	2.84	2.67
32-32.9	3.44	2.99	....	2.86	2.71
33-33.9	3.50	3.01	....	2.88	2.75
34-34.9	3.56	3.03	....	2.90	2.79
35-35.9	3.61	3.05	....	2.92	2.83
36-36.9	3.65	3.07	....	2.94	2.87
37-37.9	3.68	3.09	....	2.96	2.89
38-38.9	....	3.11	....	2.98	2.91
39-39.9	....	3.13	....	3.00	2.93
40 and up	....	3.15	....	3.02	2.95

*Includes Oklahoma, part of Kansas, North Dakota, West Texas (sweet) and North Central Texas. †Low cold test Gulf Coast. ‡Sour. §Most buyers are posting Wyoming sour in two schedules, 15°-26.9° and 27°-40°.

Effective dates: California January 17, 1957, east of California, January 3-January 10, 1957; Pennsylvania Grade, July 26, 1957.

FLAT PRICES

Louisiana:	
Bienville (distillate)	$3.05
Ville Platte	3.45
Texas:	
East Texas	3.25
Conroe	3.53
Van	3.08
Pennsylvania Grade:	
Bradford	4.65
Middle District	4.47
Southwest Pennsylvania	4.18
West Virginia	4.00
Buckeye Grade	4.00
Zanesville Grade	3.04
★ **Illinois Basin**	3.00-3.05
Canada:	
Leduc-Woodbend	2.74
Redwater (Alta.)	2.63
Smiley (Sask.)	2.40
Pembina	2.61

FOREIGN

Venezuela:	
Cumarebo, 48°-49.9°, Tucupido	3.75
San Joaquin, 41°-41.9°, Puerto La Cruz	3.34
Oficina, 35°-35.9°, Puerto La Cruz	3.05
Tia Juana medium, 26.5°-26.9°, Amuay*	2.55
Quiriquire, 16.5°-16.9°, Caripito	2.45
Lagunillas heavy, flat, Amuay or Las Piedras*	2.38
Bachaquero, flat, Las Piedras*	2.23

Prices for all crudes of 24° or lighter vary 2 cents per degree change, up or down. All crudes heavier than 24° vary 2.5 cents per half-degree gravity change.

*Also available at La Salina at 3 cents per barrel less.

Middle East, Persian Gulf (cargoes, f.o.b. lifting port):	
Arabian, 36.0°-36.9°, Ras Tanura	$2.12
Iranian, 34.0°-34.9°, Bandar Masur	2.04
Iranian, 34.0°-34.9°, Abadan	1.99
Iraq, 35.0°-35.9°, Fao	1.98
Kuwait, 31.0°-31.9°, Mina-al-Ahmadi	1.85
Qatar, 41.0°-41.9°, Umm Said	2.23
Middle East, E. Mediterranean:	
Arabian, 36.0°-36.9°, Sidon	2.59
Iraq, 36.0°-36.9°, Tripoli, Banias	2.59
Far East (cargoes, f.o.b. Lutong, Sarawak):	
Seria Light, 37°	2.75

TANKER RATES PER LONG TON

(Latest reported spot fixtures)

Gulf-U.S.N.H., dirty (USMC—30%)	$2.00
★ Gulf-U.S.N.H., clean (USMC—10%)	2.57
★ Carib.-U.S.N.H., clean (USMC—10%)	2.43
★ P.G.-Italy, dirty (USMC—65%)	2.71

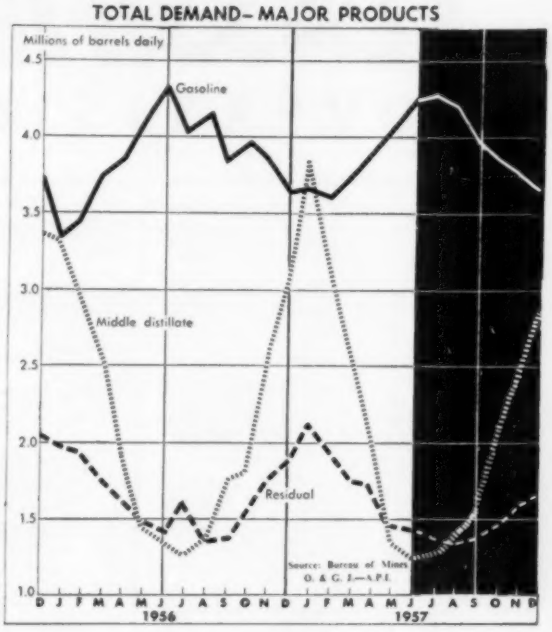
SUPPLY AND DEMAND—MAJOR PRODUCTS

(Thousands of barrels daily)

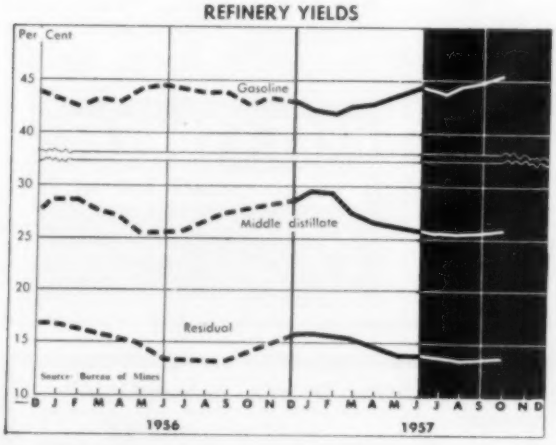
	Total demand	Refinery production	Stocks end of period†
GASOLINE			
December 1957*	3,655	3,935	196,925
November 1957	3,760	3,830	186,000
October 1957	3,937	3,895	180,902
January 1957	3,655	3,939	197,702
December 1956	3,638	3,986	187,271
KEROSINE			
December 1957*	465	345	28,600
November 1957*	355	300	32,500
October 1957	334	265	34,384
January 1957	613	367	20,019
December 1956	477	379	31,420
DISTILLATE			
December 1957*	2,410	1,875	150,500
November 1957*	2,070	1,745	167,000
October 1957	1,622	1,705	176,388
January 1957	3,220	2,118	100,572
December 1956	2,566	1,981	133,981
RESIDUAL			
December 1957*	1,650	1,110	59,400
November 1957*	1,575	1,045	58,600
October 1957	1,486	1,052	60,025
January 1957	2,102	1,322	38,403
December 1956	1,870	1,288	44,491

*Preliminary. †Thousands of barrels.

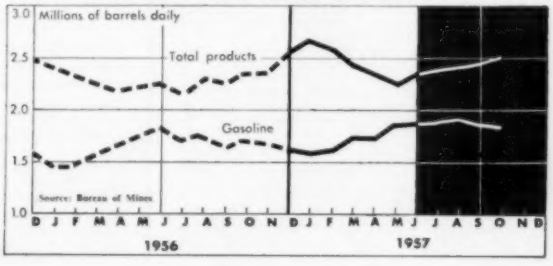
TOTAL DEMAND—MAJOR PRODUCTS



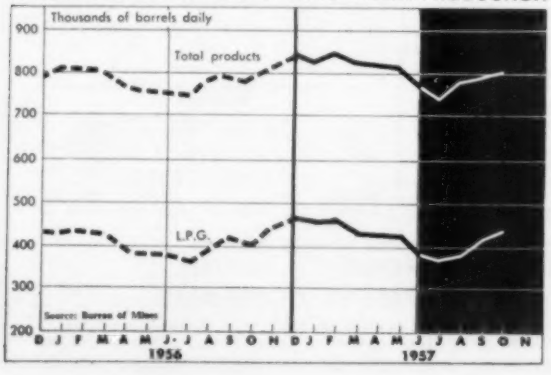
REFINERY YIELDS



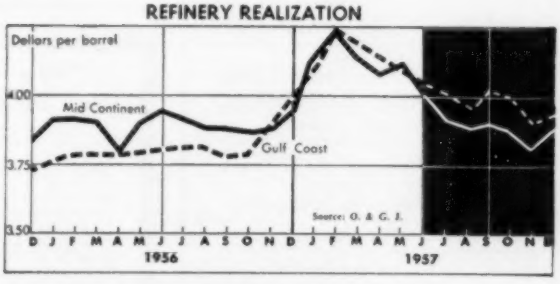
PRODUCTS DELIVERED BY PIPELINE



NATURAL-GASOLINE AND CYCLING-PLANT PRODUCTION



REFINERY REALIZATION



REFINERY REALIZATION

	Dec.* 1957	Nov.* 1957	Oct. 1957	Dec. 1956
Mid-Continent	$3.89	$3.85	$3.87	$3.95
Gulf Coast	3.94	3.92	4.01	3.98

*Preliminary.

Refinery realization is based on yields of major products and average spot prices of regular gasoline, kerosine, No. 2 fuel, and residual as published in The Oil and Gas Journal.

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FOR SALE at our Wichita gasolene plant, 14—30" OD x 40' shell, 3—section riveted absorbers. ⅛" shell, ⅜" heads filled with 3" triple spiral tile, 145# PSI, 400# Hyd. test pressure. Recently reclaimed in remodeling our plant. Each $350.00. Cities Service Oil Company—Patridge—Bartlesville.

FOR SALE at Bartlesville, one Mayhue 1000 heavy duty all purpose drill, 5" x 6" Wheatley pump, 23' Kelly, 25' mast mounted on 1951 Ford truck, 6 cylinder, 158" chassis. Unit bought new November 1946, truck March 1951. Price $6500.00. Cities Service Oil Company—Patridge—Bartlesville.

FOR SALE at our Wichita gasolene plant, 7—33" OD x 40' shell vertical code welded absorber towers, 4 sections, ⅜" shell, 450# PSIG filled with 3" triple spiral tile—each $750.00. Three shells only 28' long $500.00 each. Cities Service Oil—Patridge—Bartlesville.

FOR SALE at Long Beach, California. Five Gardner-Denver PL-7 pumps. Fair condition. Now equipped with 3½" and 4¾" plungers. BJ Service, Inc.—6505 Paramount Blvd. Long Beach 5, California.

WICHTEX C-65 heavy duty double drum well servicing unit powered with 140 GKU Waukesha. Mounted on GMC tandem truck. 7500' sand line, complete tools, now working, excellent condition. Phone RIverside 2-3839, Dallas, Texas.

WANT EQUIPMENT: Did you find the equipment you wish to purchase in this column? If not, use an "Equipment Wanted" classified advertisement to find it. It is available somewhere and Journal classified advertisements will find it. See box heading for classified rates, or write The Oil Journal.

FOR SALE: A set of casing pulling jacks with three cylinder hydraulic pump. Wilson double drum Mogul draw-works with Waukesha 6-GAK engine. Shallow well drilling rig with 42' mast, double drum powered with ohv. Ford V-8 engine mounted on low-boy. Bellaire Pipe & Supply Co., Inc. 8020 Lyons, Houston 29, Tex. OR 4-2763.

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24" x 28' Tower, 550#

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Valves: Steel & SS ½" through 6"
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Steel Tube: 1000, 900, 650, 500, 300, 200 sq. ft.
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This opening is in the 25,000 barrel refinery of an independent oil company in the continental United States. It is a complete modern facility with excellent growth prospects. The man desired is preferably graduate engineer and must have thorough experience supervision of refinery operation and maintenance along with detailed knowledge refinery economics.

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SALES REPRESENTATIVE: Four years experience selling and supervisory, Mid-Continent, to production, pipeline, drilling; including cathodic protection and drilling fluids, B.S. degree, business. Age 35. Harry Doughman, 4504 West Easton Place, Tulsa.

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OIL SCOUT—West Texan, 30, B.B.A., desires scout job with major or independent. Experience in Williston Basin and South Louisiana. Box K-495, The Oil and Gas Journal, Tulsa, Oklahoma.

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SEISMOLOGIST, 34, 8 years experience Rocky Mountain, Gulf Coast and Lake Maracaibo, some as party chief wishes work with contractor or major, foreign preferred. Box K-492, The Oil and Gas Journal, Tulsa, Oklahoma.

GEOLOGIST-GEOPHYSICIST, 33, married, family, 8½ years experience, 5 years geophysical in Colorado, Nebraska, Montana, North Dakota, South Dakota, Alberta, Saskatchewan. Last 3½ years geological in Montana and North Dakota. 2517 Arnold Lane, Billings, Montana.

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THE OIL AND GAS JOURNAL

BOX 1260 • TULSA 1, OKLA.

Refinery Gets New Controls

REGENT REFINING (Canada), Ltd., has tackled a cold-weather problem by installing complete electronic instrumentation on three new units at its Port Credit, Ont., refinery.

The new equipment includes a UOP fluid catalytic cracking unit, UOP polymerization unit, and gas concentration facilities. These are among the first refining units in the world designed to operate without using air in any phase of instrument control.

Electro hydraulic valves work from electrical signals. The control instruments receive signals which show changes in temperature, pressure, or flow. The new system eliminates freeze-ups in pneumatic lines.

The new units are the first step in an expansion and modernization program at the 12,600-bbl. plant. The cat cracker has a capacity of 7,000 bbl. daily. The chamber-type polymerization unit is designed to produce 730 bbl. of debutanized polymer gasoline daily. Procon (Canada), Ltd., installed the new units.

LEGAL

U. S. DEPARTMENT OF THE INTERIOR, Bureau of Land Management, Land Office, Cheyenne, Wyoming. Notice is hereby given that approximately 3116.27 acres of land in 29 parcels within the known geologic structures of various fields in Albany, Big Horn, Carbon, Hot Springs, Laramie, Natrona, Park and Washakie Counties, Wyoming, will be offered for oil and gas leasing through competitive bidding to the qualified bidder of the highest cash amount per acre through sealed bids on or before February 5, 1958, when bids will be opened. Details of the lease offering, and how and where to submit bids, may be obtained from the Land Office, Cheyenne, Wyoming. Craig A. Decker, Manager.

LEGAL

U. S. DEPARTMENT OF THE INTERIOR, Bureau of Land Management, 1245 North 29th Street, Billings, Montana. Notice is hereby given that approximately 257.39 acres of land in two parcels within the known geologic structure of CEDAR CREEK FIELD in North Dakota and 1343.08 acres of land in ten parcels within the known geologic structure of KEVIN-SUNBURST FIELD in Montana will be offered for oil and gas leasing through competitive bidding to the qualified bidder of the highest cash amount at 10:00 A.M., M.S.T., March 5, 1958 when bids will be opened. The following are the lands offered for sale: **CEDAR CREEK FIELD.** T. 130 N., R. 106 W., 5th P.M., North Dakota; **Parcel No. 1,** Sec. 21, Lots 8, 11, W½NW¼, containing 121.64 acres. **Parcel No. 2,** Sec. 29, SE¼NW¼, E½SW¼, Sec. 32, Lot 4, containing 135.75 acres. **KEVIN SUNBURST FIELD.** All lands in Principal Meridian Montana: T. 34 N., R. 2 W., **Parcel No. 3,** Sec. 6, Lots 1, 2, S½NE¼, containing 159.76 acres. **Parcel No. 4,** Sec. 6, Lots 3, 4, 5, SE¼NW¼, containing 151.41 acres. **Parcel No. 5,** Sec. 6, Lots 6, 7, NE¼SW¼, containing 111.91 acres. **Parcel No. 6,** Sec. 6, SE¼, containing 160.00 acres. T. 35 N., R. 1 W., **Parcel No. 7,** Sec. 33, W½SW¼, containing 80 acres. T. 35 N., R. 2 W., **Parcel No 8,** Sec. 2, SE¼, containing 160.00 acres. **Parcel No. 9,** Sec. 12, NE¼, containing 160.00 acres. T. 35 N., R. 3 W., **Parcel No. 10,** Sec. 27, SW¼NE¼, N½SE¼, containing 120.00 acres. **Parcel No. 11,** Sec. 27, E½SW¼, S½SE¼, containing 160.00 acres. **Parcel No. 12,** Sec. 34, NW¼NE¼, NE¼NW¼, containing 80.00 acres. Details of the lease offering, how and where to submit bids, may be obtained from the Manager of the Land Office, Bureau of Land Management, 1245 North 29th Street, Billings, Montana. Theo E. Anhder, Manager, Land Office.

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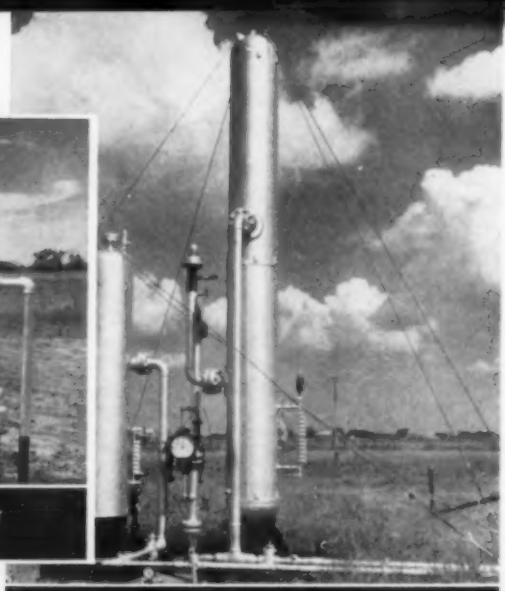

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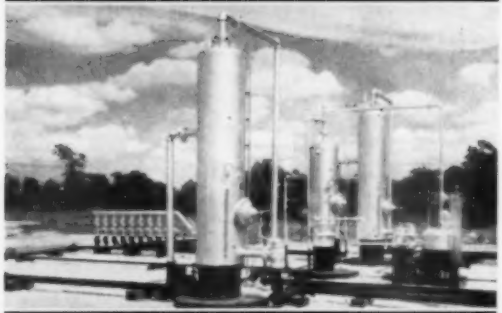

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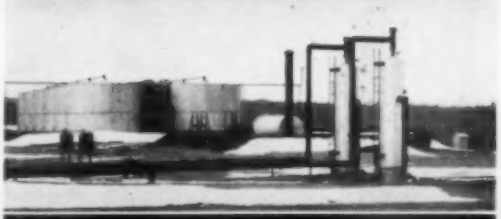

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